US Route 1 - Fort Belvoir to Huntington Metrorail Station

Transit Improvement Study

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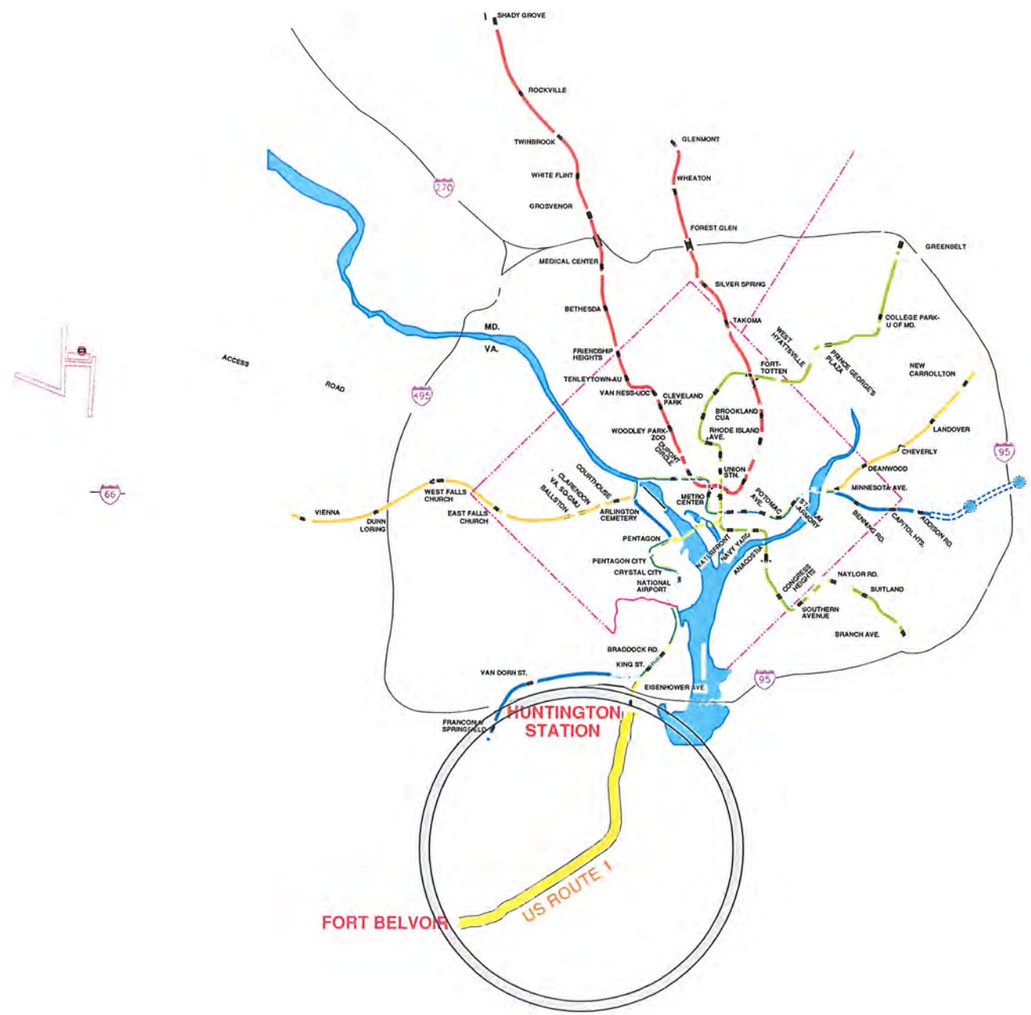

metro

Department of Planning and Strategic Programs
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US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station

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1. Executive Summary

The U.S. Route 1 corridor between Ft. Belvoir and the Huntington Metrorail station has been identified as a corridor in need of reconstruction and enhanced transit service. This planning and implementation study offers a phased implementation program that takes advantage of proposed VDOT plans to widen the roadway and Fairfax County recommendations to improve transit in the corridor. By recognizing that highways should be designed as multi-modal facilities and that road reconstruction and transit improvement projects should be coordinated under one 'transportation improvement strategy,' available funding can be used in a more efficient manner.

This transit improvement plan includes three service phases and provides conceptual designs and schematics for a number of the new facilities associated with each phase of the service. In the near-term, the first phase implements current Fairfax County plans for providing enhanced bus service in the corridor. Program highlights include:

- streamlining bus service and routes;
- adding GPS and SmartCard payment technology to buses;
- implementing signal priority in the corridor for buses; and
- improving/enhancing pedestrian/passenger facilities.

The second phase builds upon the enhancements provided in the first phase and introduces a new type of rapid transit to the corridor known as 'bus rapid transit' or BRT. BRT does not require fixed guideway construction; rather, it is a rubber-tired system that runs either in mixed traffic or in dedicated lanes. However, BRT still offers many of the benefits of a traditional rail system such as light rail. Like rail systems, BRT has an 'identity' that makes it easy for riders to locate it, ride it and to understand its route and schedule. It includes a number of technological enhancements that improve running way travel times and on-time arrival, and provide passengers with easy access and adequate and real-time information.

BRT service likely would be implemented along the Route 1 corridor in two stages: the first stage would operate buses in general traffic, but would give the specially marked buses signal and lane priority at key intersections and would run with greater frequency. The second stage takes advantage of the new fourth lane VDOT has proposed north of Mt. Vernon Highway, giving buses semi-exclusive right-of-way (sharing lane with right turning vehicles) in which to operate. Conceptual designs for special stops and transit centers specific to the new system accompany the service description.

Finally, should ridership increase to projected levels, the third phase would introduce light rail transit (LRT) in the corridor. This long-term recommendation (2025+) would involve evaluating two potential running way alignments: curb lane and median. Pros and cons of each alignment are discussed in this section and design schematics for both are provided. Ideally, a number of the facilities built for BRT service could be converted to serve LRT.

Typical 4-lane undivided section along existing Route 1

Typical 5-lane undivided section along Route 1

2. Introduction: Background, Purpose & Goals

2.1 Background

For many years, U.S. Route 1 ("Route 1") served as a major north-south commuter connection. However, with the construction of facilities such as I-95 and I-395, Route 1 has become less of a commuter connection and more of a route serving surrounding suburban development seeking to access commercial locations and establishments along the corridor. To address the changed nature and function of the Route 1 corridor in Fairfax and Prince William Counties, a number of corridor studies have been commissioned over the years.

Virginia Department of Transportation Studies
In 1997, at the behest of the Virginia General Assembly, the Virginia Department of Transportation (VDOT) completed a comprehensive transportation assessment of the corridor, resulting in a number of recommendations for transportation improvements including widening the road to increase passenger throughput. In 1998, as a follow on to those recommendations, VDOT began a Location Study ("VDOT Study") examining the potential for widening and improving a 27.3-mile segment of Route 1 from the Capital Beltway (I-95/I-495) in Alexandria to Chopawamsic Creek on the Prince William/Stafford County line. The on-going study is examining the environmental impacts and costs of adding an additional, oversized lane (to accommodate bicycles) in each direction and a landscaped raised median and associated intersection improvements along the entire corridor. It also is identifying options for both the location of a future centerline and the right-of-way that should be reserved for the future roadway expansion.

The VDOT Study likely will recommend that north of Mount Vernon Highway (Route 235) the additional lanes be reserved for buses and vehicles making right turns. However, the decision as to whether the lanes would be reserved for buses or open to all traffic could be revisited closer to the time of construction. Overall, the direction of the study is supported by regional planning efforts--both Fairfax County's Comprehensive Plan and the National Capital Region's Constrained Long-Range Plan (CLRP) call for an additional lane on Route 1 in each direction.

Northern Virginia Transportation Commission Study
In May 2001, the Northern Virginia Transportation Commission (NVTC) prepared a report ("NVTC Study") documenting existing transit usage in the Route 1 corridor and recommended a number of improvements. The NVTC Study determined that the Route 1 corridor required major transit enhancements to support the altered focus of the corridor from a major north-south travel corridor along the eastern seaboard to a local route primarily serving residents and businesses in southern Fairfax County. Such enhancements included: providing new and expanded bus service, upgrading bus stops and pedestrian facilities, establishing transit centers with Park & Ride facilities and installing Intelligent Technology Systems (ITS) on buses to provide real-time schedule information and give buses traffic priority.

WMATA Regional Bus Study
In addition to the VDOT and NVTC studies, in 2000, the Washington Metropolitan Area Transit Authority (WMATA) initiated the Regional Bus Study ("Regional Bus Study") to assess the region's non-rail transit needs. The study recommended that a new type of bus service known as Bus Rapid Transit--described later in this report--be introduced between Fort Belvoir and Alexandria. Due to the high bus ridership in the corridor, the study concluded that some level of investment to improve transit operating speeds and capacity was justified. Because VDOT has identified this corridor as a candidate for widening within the next 10-20 years, transit running way improvements to support this new type of service could be incorporated into widening plans where physically feasible.

Typical 6-lane divided section along existing Route 1 between Mt. Vernon Pkwy and I-495

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2.2 Purpose & Methodology

The purpose of this study is to develop a phased plan for implementing transit service enhancements in the Route 1 corridor that build upon the VDOT and NVTC Studies. It will (1) describe and examine options for phased transit improvements, (2) identify additional right-of-way requirements for each scenario, (3) identify locations and develop concepts for station stops and transit centers, and (4) develop order of magnitude ridership estimates for the bus enhancements.

This conceptual design and implementation plan incorporates recommendations from the Regional Bus Study, the NVTC Study and the Fairfax County Comprehensive Plan and focuses on transitway improvements for the approximately 11-mile segment from Pohick Road (just south of Telegraph Road, Route 611) to the Capital Beltway (I-95/I-495) interchange in Fairfax County. ***The plan seeks to use available funding in a more efficient manner by a) recognizing that highways should be designed as multi-modal facilities and b) combining transit and highway improvement projects into one 'transportation improvement strategy.'***

WMATA staff began this study in Fall 2002. Four major tasks undertaken for this project included:

- documenting existing conditions and providing preliminary demand estimates
- reviewing existing reports and studies
- developing roadway cross-sections for transit options
- identifying locations for Bus Rapid Transit service station stops, transit centers and a maintenance facility.

2.3 Transit Improvement Goals

Many long distance commuters, traveling north to the urban core from Prince William County and farther south, use the HOV lanes on I-95 and I-395, access the Franconia-Springfield Metrorail Station via I-95, or ride the Virginia Railway Express (VRE). Therefore, the primary focus of transit improvements in the Route 1 corridor is to serve the needs of residents making local trips within the corridor and to provide strong connections to Fort Belvoir and the Metrorail system at Huntington. These dual functions should contribute to the revitalization of the commercial areas in the corridor and serve the transportation needs of the residents as well. The primary objective of any transportation improvement in the corridor should contribute to an improved quality of life for the residents.

The transit improvement goals in the corridor include:

- Improving pedestrian safety and accessibility to transit services.
- Providing enhanced and increased bus service in the corridor to better serve area residents and to offer viable transit options to improve mobility and accessibility in the corridor.
- Promoting inter-modal connections between Metrobus and Fairfax Connector bus services and VRE commuter rail and Metrorail by building transit centers and park and ride lots at key activity centers.
- Supporting economic development opportunities through revitalization and transit-oriented development.

Existing bus pull-out lane along northbound Route 1

Current passenger amenities at a Metro/Connector stop along Route 1

3. Existing Conditions

3.1 Location & Description

The Route 1 corridor is an historic roadway south of Washington, D.C., which served as the primary north- south connection for long distance travel prior to construction of I-95 south of the Capital Beltway. Today, the function of the corridor has shifted to serving commuter traffic and local travel within the corridor. The corridor experiences heavy traffic congestion in the peak direction at peak periods, but carries relatively little end-to-end through traffic. Current Route 1 traffic volumes in the study area range from 35,000 to 70,000 vehicles per day. By 2025, these volumes are projected to increase to a range of 50,000 to 90,000 vehicles per day.

The Route 1 Transit Study Corridor in Fairfax County (as defined in the NVTC Study) is roughly the area between the Potomac River to the east, Telegraph Road to the west, and south of the Capital Beltway to the Fairfax County/Prince William County border. In 2000, this corridor contained 44,000 households and 51,000 jobs. Metropolitan Washington Council of Governments (MWCOG) Round 6.2 Cooperative Forecasts project this area to grow to 50,500 households and 59,000 jobs by the year 2010, and 55,000 households and 66,000 jobs by the year 2025. Over the 25 year time period, households are projected to increase by 25 percent and jobs are projected to increase by 29 percent.

One of the most significant activity centers in the corridor is Fort Belvoir. Current MWCOG forecasts assume that Fort Belvoir will only grow by 2,600 jobs between 2000 and 2025. However, plans recently released by the military anticipate an increase of more than 12,000 jobs in the next ten years. Household projections for Fort Belvoir also appear low, as they do not account for the planned increase of about 1,000 new housing units.

Household densities in the corridor are highest at the northern end of the corridor, and lowest around Fort Belvoir. The area immediately adjacent to the Huntington Metrorail Station currently contains more than 12 households per acre. Other areas with significant household densities are primarily located along the western edge of Route 1, ranging from four to six households per acre in 2000, and six to eight households per acre by the year 2025. The density of the area east of Route 1 is lower, ranging from two to four households per acre in 2000, with slight increases in density projected through 2025.

The corridor also is home to a sizable low-to-moderate income population and is one of the most transit-dependent corridors in Fairfax County. There also are a number of older shopping centers and properties that are potential areas for redevelopment. In fact, the Fairfax County Economic Development Authority and the Southeast Fairfax Development Corporation currently are negotiating with potential developers for some of these sites.

Existing MetroBus/Fairfax Connector Stop inside Ft. Belvoir Military Base

Low density shopping center with redevelopment potential

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3.2 Existing Transit Service in the Corridor

The Route 1 Corridor currently is served by Metrobus and a number of Fairfax Connector routes that operate on different portions of the highway.

Metrobus Route 9A, the Richmond Highway Line, runs from the Lorton VRE Station to Fort Belvoir and Huntington Station along Route 1. The route continues through downtown Alexandria with its terminus at the Pentagon. Route 9A runs three trips in the peak hour, with 20-minute headways. Off-peak headways are 30 minutes.

Fairfax Connector bus routes in the corridor include:

Routes 101 and 102, the Fort Hunt Road Line, primarily connects residential areas east of Route 1 with the Huntington Metrorail Station. These routes each operate with 30-minute headways in the peak hour and peak direction.

Route 103, the Belle View Line, serves a similar market but operates only one trip per hour in the peak period.

Routes 105, 106, 107, the Richmond Highway Line, connects as far south as Fort Belvoir with the Huntington Metrorail Station primarily via Route 1. The 105 begins service at Sacramento Dr., north of Fort Belvoir and serves residential areas to the west of Route 1. It operates on 15-minute headways in the peak hour and peak direction. The 106 begins service at Mt. Vernon Hospital and operates only in peak periods on 30-minute headways. The 107 begins service at Fort Belvoir and operates in the peak hour on 30-minute headways, but essentially serves the same route as MetroBus 9A. It also makes select trips to Old Town Alexandria. The 30-minute headway schedules for the 107 and the 9A are staggered, providing riders with 15 minute service during peak periods.

3.3 Current Travel Demand In the Corridor

The Route 1 Corridor already has significant bus ridership on the Metrobus and Fairfax Connector routes.

Existing bus ridership in the Route 1 Corridor is:

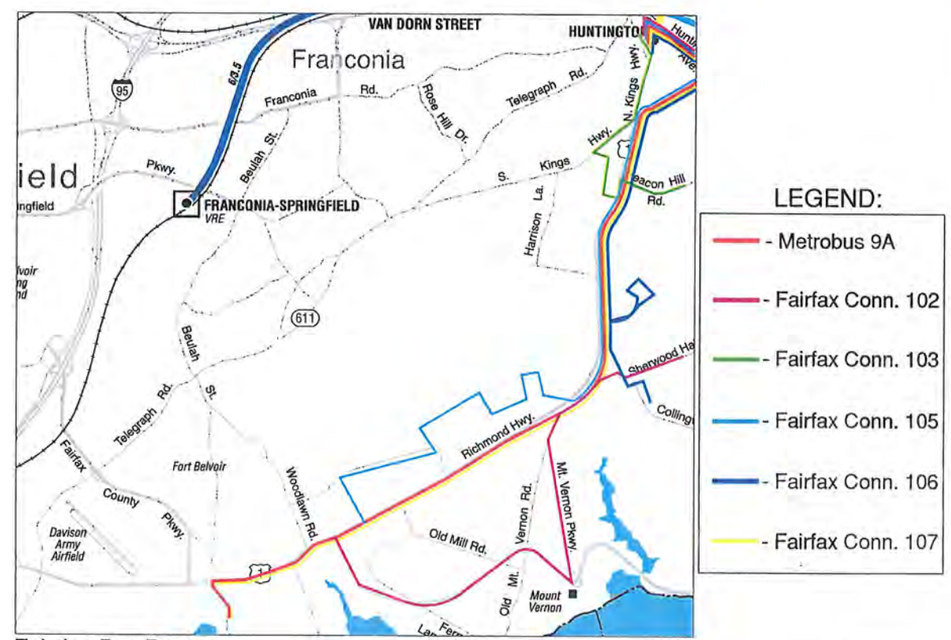
Metrobus Route 9A: 2,400
Fairfax Connector: 4,800
(Routes 101-107)
Total: 7,200

Table 1 shows the existing and forecasted boardings and alightings at the two Metrorail stations in the area. In 2002, Huntington Station had about 8,100 boardings per day. Currently about 20 percent of riders accessing the Huntington Station arrive by bus. Growth on the Metrorail system is expected to increase boardings and alightings at the Huntington Station by 65 percent from 2002 to 2025.

Table 1: Ridership at Nearby Metrorail Stations

	Huntington	Franconia-Springfield
Existing (2002) Boardings	8,100	8,400
Future (2025) Boardings	13,400	14,200
%Change	+65%	+69%
Access Mode to Station*		
%Transit	19.7%	10.7%
%Park	53.7%	74.9%
%Drop-Off	11.1%	8.1%
%Other	15.5%	6.3%

*2002 Metrorail Passenger survey



Existing Bus Routes

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4. Phased Transit Improvement Plan

4.1 Service Plan

This transit improvement plan consists of three phases to be implemented over the next 20+ years. Near-term recommendations can be introduced almost immediately with few major design concerns. Longer-term recommendations are predicated upon VDOT widening activities in the corridor, as well as ridership demands.

4.1.1 Phase 1: Enhanced Bus Service (short-term)

This phase essentially implements the recommendations made in Fairfax County's Richmond Highway (Route 1) Public Transportation Development Plan. No road widening occurs in this phase and buses operate in general purpose lanes along Route 1. The current arrangement of three lanes (each direction) in the northern section of Route 1 (north of Mount Vernon Highway) would be maintained and buses would operate in the curb lanes. Buses would stop at existing bus stops on Route 1 to pick-up and discharge passengers (i.e., no bus pull-outs).

This short-term enhancement program would improve bus service and reduce travel times by:

- streamlining routes to better coordinate services and provide better access to key locations;
- equipping Fairfax Connector buses with global positioning system technology (GPS) to better track buses;
- implementing a bus priority signal system (i.e., providing an extended green phase at signals for buses and through traffic); and
- installing electronic fare payment SmartCard technology on buses.

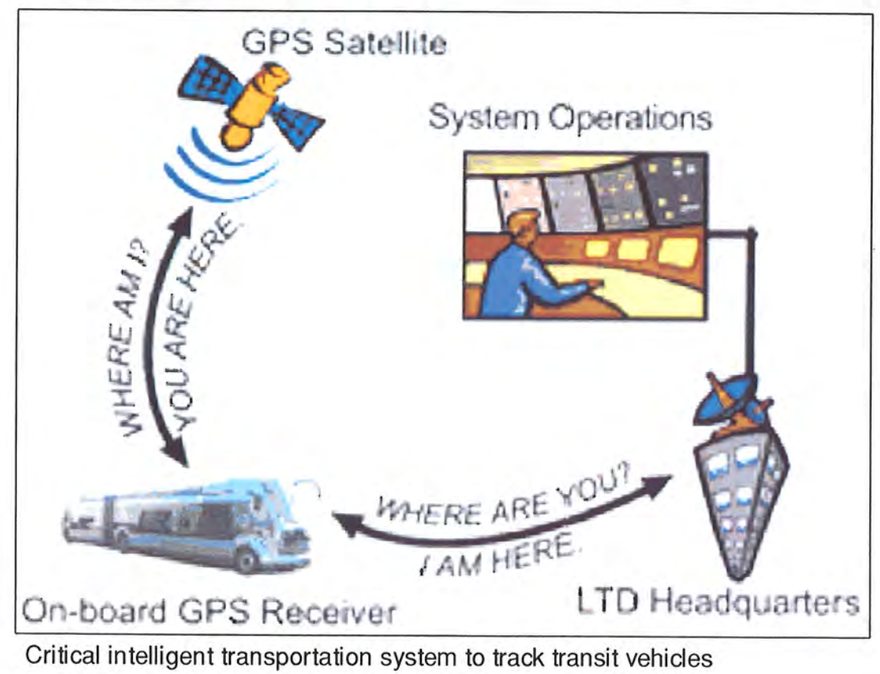
In addition, this phase should consider using queue jumper lanes at key intersections, allowing buses to move to the "front of the line" at signals and minimizing delays. Queue jumpers would require additional right-of-way (approximately 12'x150') at intersections.

The program also plans to improve pedestrian facilities and increase transit accessibility by:

- improving 20 priority bus stops and intersections by adding any or all of the following: crosswalks, signal countdowns, pavement markings, better signage, median refuges, bus shelters with trash receptacles and benches, sidewalks to bus stops and better street lighting;
- constructing missing sidewalk and trail segments along Route 1 and connecting streets; and
- developing and implementing a multilingual pedestrian safety and transit education program.

Lastly, transit centers with Park & Ride facilities would be located at key activity centers.

Potential queue jumper lane layout



Critical intelligent transportation system to track transit vehicles

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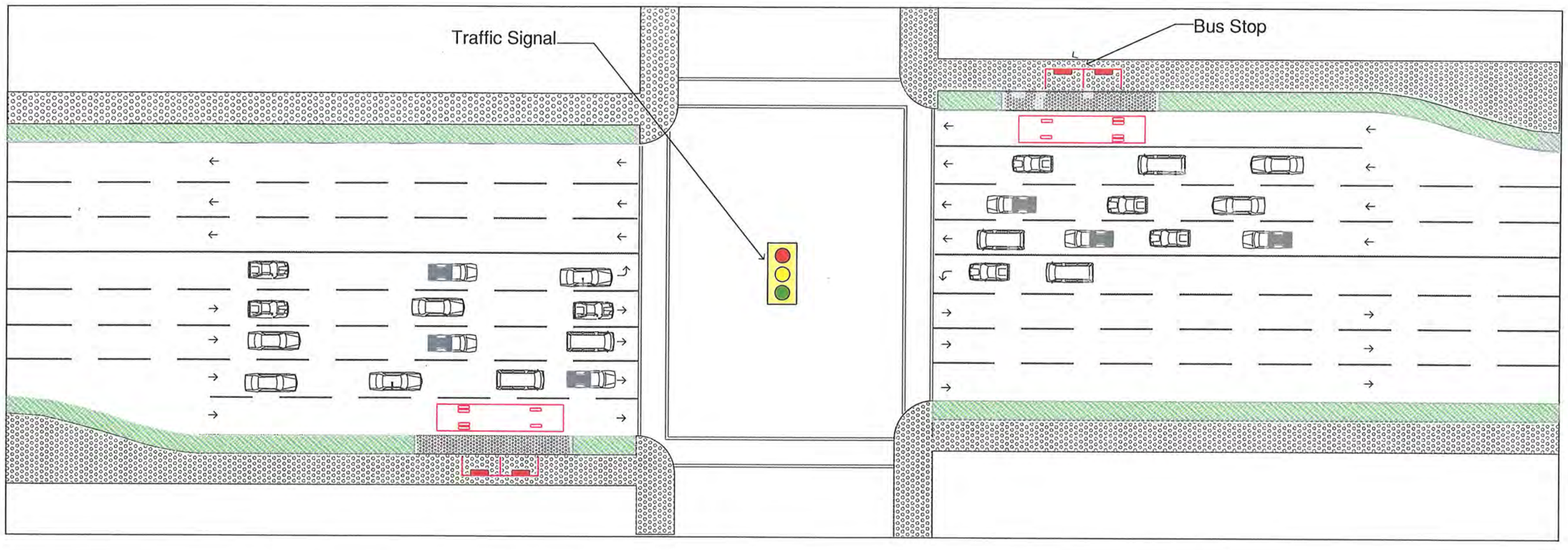
US Route 1 - Fort Belvoir to Huntington Metrorail Station

Short Term Transit Improvements
Typical Queue Jumper Lane at Intersections with Near Side Bus Stops



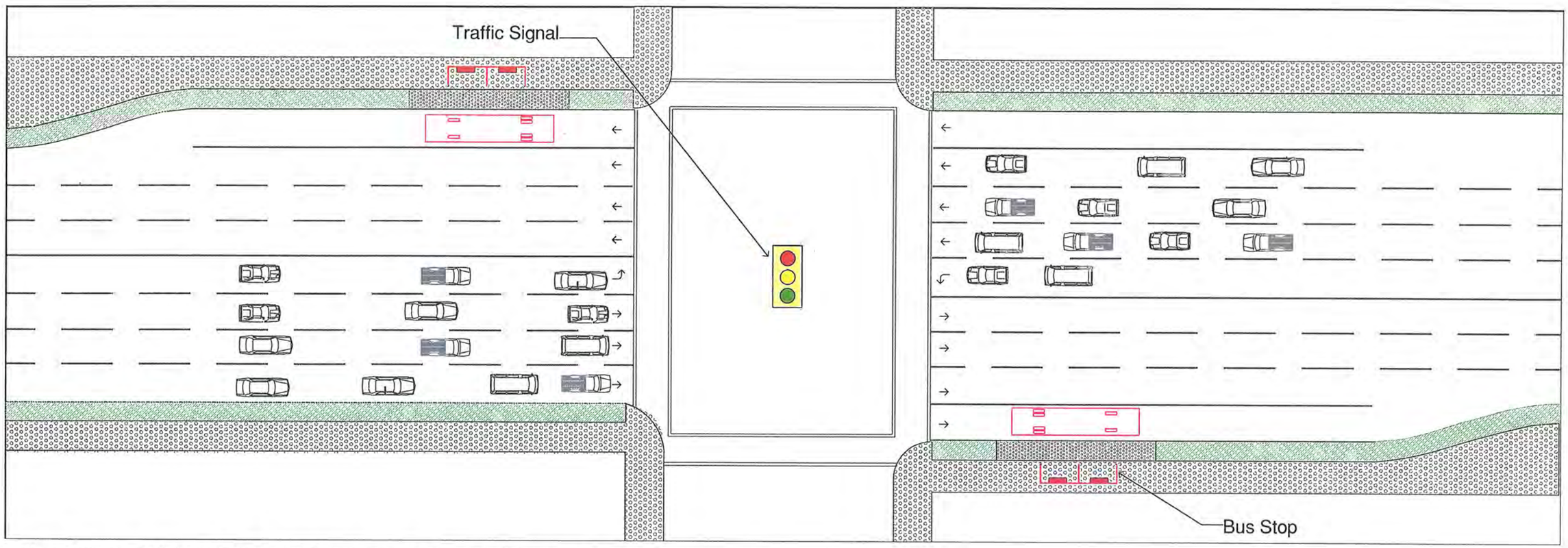
Queue jump lanes allow buses to avoid the long vehicle queues at signalized intersections by using the right lane to move past the queue. The bus pulls into the right turn lane and proceeds to discharge and pick-up passengers during the red signal phase then receives an advance green signal, resulting in reduced delay waiting for the queue in the regular lanes to clear the intersection.

- Length of queue jump lanes varies depending on the average traffic queue length at the intersection and the available right-of-way (300' preferred and 150' minimum).
- Special signal phase required for buses to jump ahead of queue.
- Bus stop located nearside of intersection.

Source: Transit Capacity and Quality of Service Manual, 2nd Edition

US Route 1 - Fort Belvoir to Huntington Metrorail Station

Short Term Transit Improvements
Application of Transit Signal Priority at Intersections with Far Side Bus Stops



When buses operate in mixed traffic, the interference caused by general traffic decreases bus speeds and lowers overall bus reliability. A significant amount of delay to transit vehicles in urban area is caused by traffic signals. Traffic signal priority can be implemented to improve bus reliability. Bus signal priority concept includes extending, activating early or entirely skipping a phase. When a bus approaches an intersection, the bus issues a request and communicates with one or a series of downstream traffic signal controllers for priority. In this example, the traffic signal would extend the green phase allowing the bus, along with general traffic, to proceed through the intersection on the green phase. The bus would then stop at a far side bus stop to serve the passengers and merge into the travel lane while vehicles downstream are stopped at the traffic signal during the red phase.

4.1.2 Phase 2: Bus Rapid Transit (long-term)

Bus Rapid Transit (BRT) service is a flexible, rubber-tired form of rapid transit that combines stations, vehicles, services, running way and intelligent transportation system (ITS) elements into an integrated system with a unique identity. BRT service also incorporates a variety of features to minimize travel time and maximize the convenience for passengers. These features include: traffic signal priority, semi or dedicated right-of-way, queue jumper lanes, automated vehicle fare collection (on board vehicle or off board), automated information systems, low floor and/or level boarding, passenger stations and enhanced passenger amenities. BRT services range from advanced-design optical-guided buses operating in dedicated right-of-way to standard transit buses operating a new limited stop express service over an existing route.

BRT systems use unique advanced-design buses or traditional buses that "brand" the service as unique. This branding extends not only to the buses but also to the bus stops, shelters, stations, running ways, signage and real-time information facilities. Just as a rail line has an identity that makes it stand out from the local bus network, BRT must have an identity that is separate from regular bus service. This identity provides a landmark for passengers entering the system and also provides an immediate understanding of the areas of the city/region served by the BRT service.

In the next phase of the Route 1 transit plan the concept of BRT service is introduced in the corridor. Development of the service will likely occur in two stages: Stage 1, where the service operates in general traffic lanes and, Stage 2, where the service operates in priority bus lanes.

Stage 1: Limited BRT

The BRT service proposed for Route 1 takes advantage of VDOT's plan to widen this segment of the corridor. As in Phase 1, a number of enhancements to the service are made, but at this stage, an 'identity' for the system is developed and built. Customers will be able to easily identify routes, stops and buses due to the system's integrated design scheme.

Buses are not yet operating in an exclusive or near-exclusive lane at this stage, rather they operate with general purpose traffic. However, specially designed buses operate on the designated route making them easy for customers to identify. These buses operate in the newly constructed lane along with general-purpose traffic as described in Phase 1 on 10-minute headways during weekday peak hours and 15-minute headways during off-peak hours. Bus stops and shelters also designed specifically for the system would be built at key locations in the corridor, again making the system easy to identify. No bus pull-outs are constructed at this stage, rather buses pick-up and discharge passengers at the curb. Transit centers designed specifically for the system with adjacent Park & Ride lots would be provided at key activity centers.

As with Phase 1, transit travel times and reliability would be improved by implementing traffic signal priority and queue jumper lanes.

BRT Station Stop with a canopy and bus optical guidance system in Nancy, France

Los Angels Metro Rapid Bus with a canopy, route map and real time travel information

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Stage 2: BRT with Priority Lanes

The next potential stage of BRT service takes advantage of VDOT's proposal that the new fourth lanes north of Mount Vernon Highway be designated for buses and right-turning vehicles. It also builds upon facility and service improvements previously made in earlier phases of this transit plan. Under this scenario, bus service would be increased significantly and divided into local and express routes. Express routes would primarily serve express bus stops and a few transit centers along the corridor, with local routes serving the stops in between. Travel times on all routes would benefit greatly from the near-exclusive use of a lane and from the use of traffic signal priority. Bus pull-outs would be constructed at bus stops in order to allow express buses to pass buses serving passengers at local stops. As in the previous scenarios (Phases 1 & 2), pedestrian facilities and bus stops would be improved. Transit centers with parking would be provided at key activity centers.

BRT priority running way with colored pavement to provide special identity and easy enforcement of bus lanes

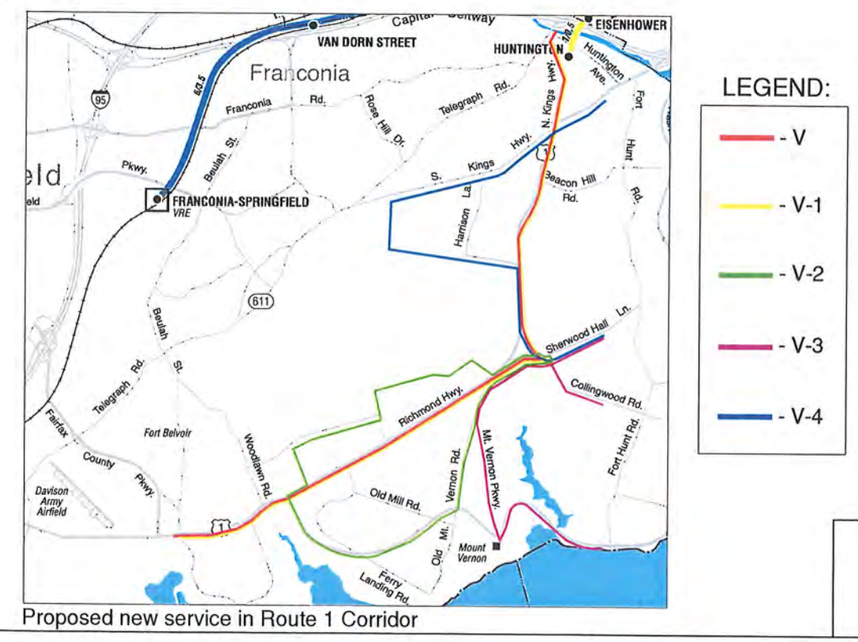
In fact, in its long-term recommendations (2010+), the Regional Bus Study suggested that a BRT service called *RapidBus* be introduced to enhance transit service along the Route 1 corridor. The service would run between Fort Belvoir and the Huntington Metrorail Station with complementary local feeder/distributor circulators or shuttles. The circulators would replace Fairfax Connector service in this corridor on Routes 101, 102, 103, 105, 106, and 107 as well as a low-ridership segment of Metrobus 9A between Fort Belvoir and Lorton, and feed into the *RapidBus* stops and transit stations. *RapidBus* would take advantage of major roadway improvements in this corridor and serve as an extension of the Metrorail Yellow Line and the proposed Route 1 light-rail service from the Pentagon to Alexandria identified in the WMATA Transit Service Expansion Plan.

The *RapidBus* service would operate seven days a week between Fort Belvoir and Alexandria. Weekday service would operate from 6:00 a.m. to midnight. Weekend service would run between 8:00 a.m. and 10:00 p.m. On weekdays, service would run every 10 minutes during the peak and every 20 minutes off-peak. Saturday service would run every 15 minutes and Sunday service every 20 minutes. Complementary local service on Metro 9A would have the same service span but run less often. Headways would be 15 minutes in peak periods, 30 minutes off-peak and Saturdays. Sunday service would run hourly.

Neighborhood circulators would provide connections to Route 1 service at proposed transit centers in the corridor. Frequency and span would match the *RapidBus* recommendation. These circulator routes may be designed to deviate from the main route, depending upon demand.

In addition, a subscription or deviated-route shuttle service to VRE service at Lorton for residents living near the station would be designed and implemented to meet commuting needs. This route also would have a fixed segment to provide service along Route 1 between Lorton and Fort Belvoir, replacing existing low-ridership Metrobus and Fairfax Connector route segments in this corridor. Service span and schedule for the fixed-route component would match the local service in this corridor. Weekday service would operate from 6:00 a.m. to midnight. Weekend service would run between 8:00 a.m. and 10:00 p.m. Headways would be 15 minutes in peak periods, 30 minutes off-peak and Saturdays. Sunday service would run hourly.

Regional Bus Study recommendations did not specify whether the service would run in general traffic lanes or in priority lanes, however, given VDOT's widening plans for the corridor, the *RapidBus* service described above could be developed according to the two-stage BRT plan outlined under Phase 2.



Proposed new service in Route 1 Corridor

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4.1.3 Phase 3: Light Rail Transit within Semi-Exclusive Right-of-Way (2025+)

The next potential phase of transit improvement, should ridership projections in the corridor warrant, would be light rail transit (LRT). LRT, consisting of up to 3-vehicle trains operating in semi-exclusive or dedicated right-of-way, would increase the person throughput in the corridor beyond that of a full BRT system. The fixed-guideway LRT system could be constructed in either the Route 1 median or in the curb lanes.

Locating the fixed guideway in the median eliminates some interference with automobiles by avoiding conflicts with the numerous entrances to shopping centers, businesses and access to driveways along Route 1. However, it also would require a wider transit envelope, produce conflicts with vehicular left turns--warranting special signal phases to ensure safe turns, and require passengers to cross the wider roadway to access the station stops located in the roadway median. Alternatively, pedestrian bridges may need to be constructed for passengers to access the station. In addition, the station stops and transit centers built curbside for the BRT system could not be converted to LRT facilities.

Operating LRT in the curb lanes would allow station stops to be constructed along sidewalks (or potentially allowing conversion of existing BRT stops to LRT stops), thereby minimizing right-of-way impacts. However, the trains would be required to accommodate vehicles sharing the tracks to make right turns resulting in a need to consolidate access points to shopping centers, businesses and other driveways.

Under either alignment scenario, light rail vehicles would be required to follow all traffic signals, and would experience cross traffic at intersections. As with the bus phases, traffic signal priority could be used to improve travel times and reliability. Some bus stops would be replaced with transit stations along the tracks, and pedestrian facilities would be improved throughout the corridor.

Median Running LRT along a suburban highway with characteristics similar to Route 1

Curb running LRT combined with a vehicular right-turn lane

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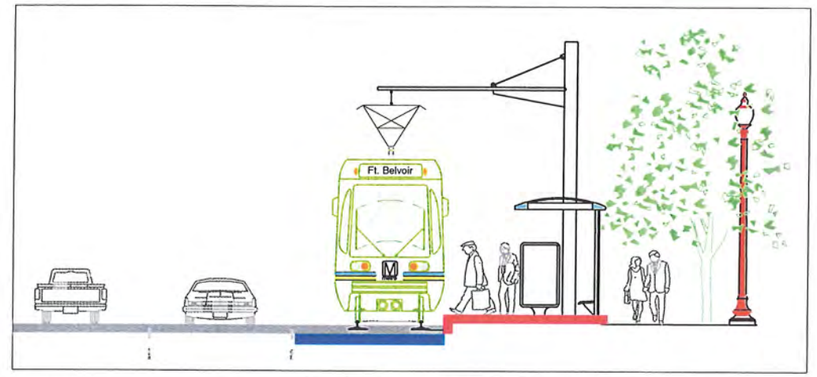
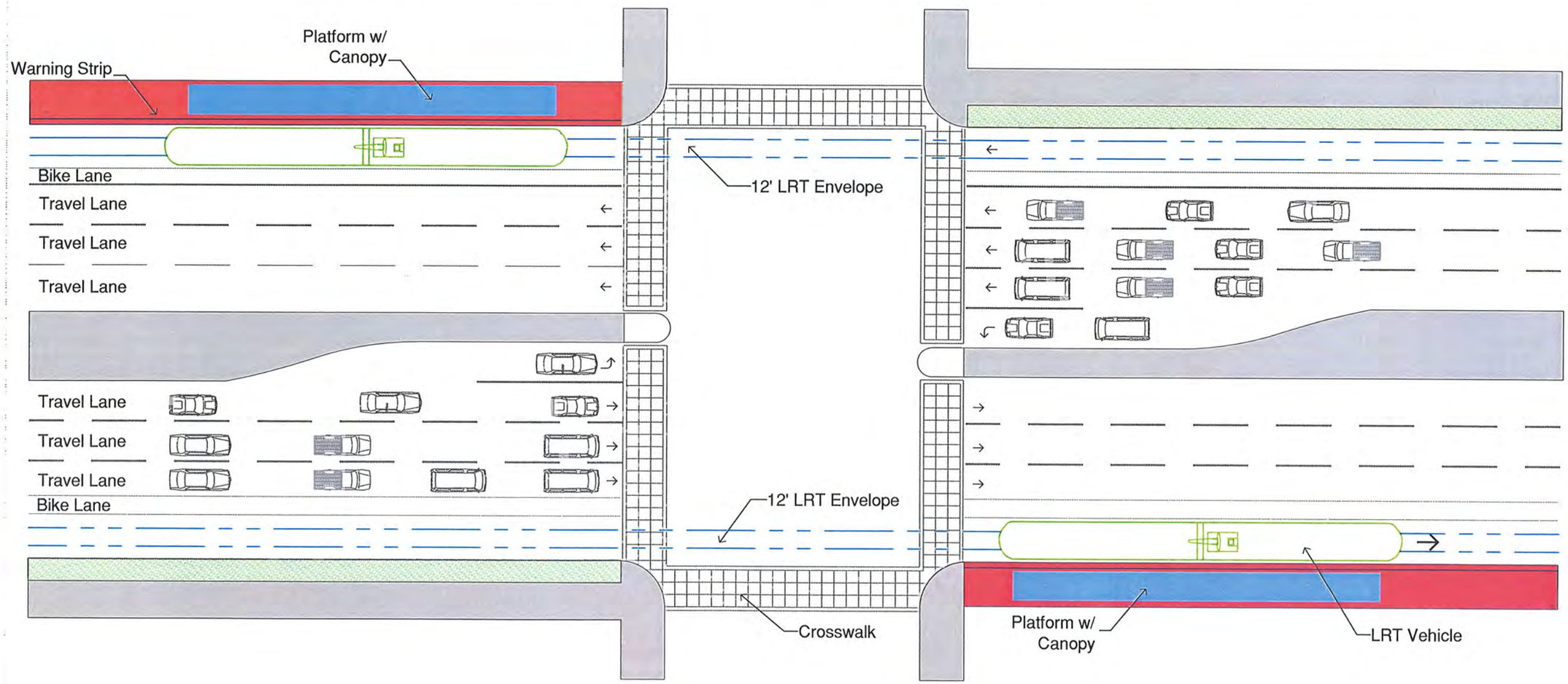
US Route 1 - Fort Belvoir to Huntington Metrorail Station

Typical Side Platform Station Stop for LRT Curb Running

This graphic illustration shows the concept for LRT operating in the curb lanes of Route 1, widened according to VDOT plans. Platforms are located on the sidewalks with canopies to provide weather protection for the waiting passengers. Curb running LRT would require 2 - 12' lanes and could operate either in mixed traffic or in an exclusive right-of-way adjacent to general purpose lanes.





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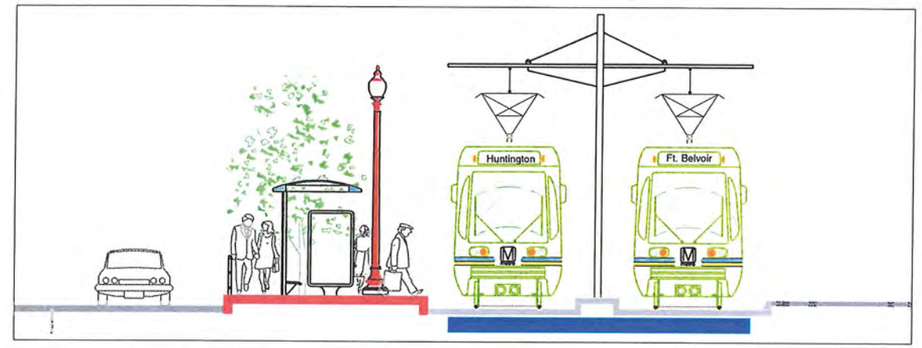
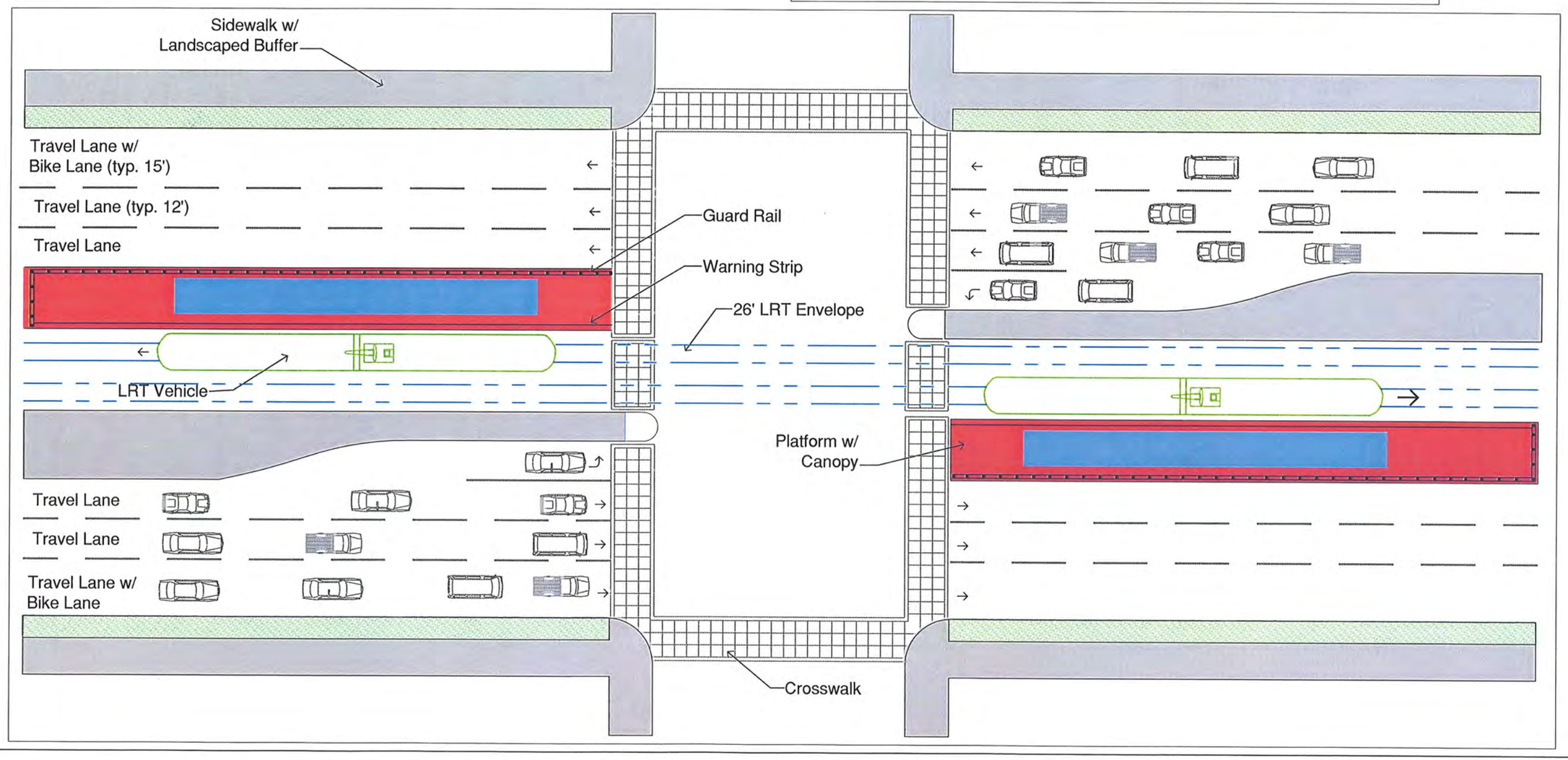
US Route 1 - Fort Belvoir to Huntington Metrorail Station

Typical Split Platform Station for LRT Median Running Stop

This graphic illustration shows the concept for LRT operating in the median of Route 1. Median running LRT would require a 26' transit envelope and would operate in an excluisve right-of-way adjacent to general purpose lanes. Additional right-of-way (beyond the VDOT proposed Route 1 widening) would be required to implement this concept. Split side platforms would be constructed adjacent to the transitway and would include canopies to provide weather protection for the waiting passengers along with other passenger amenities such as safe pedestrian access, route map and schedule, real time travel information, system map, bike racks, lighting and landscaping.





4.2 Facilities

4.2.1 BRT Station Stops

BRT station stops along this corridor must be different or branded in such a way that identifies the service as unique and different from local service. The stops should incorporate a single design and must be well maintained. All BRT stops in the corridor should have the following:

- a level, concrete pad for waiting passengers;
- safe and direct pedestrian access, including a paved, accessible route to the concrete waiting area;
- adequate lighting;
- current static bus information including route numbers, schedules and information phone numbers;
- a trash receptacle; and
- a standard shelter.

BRT "super station" stops (where boardings exceed 100 passengers per day) should incorporate all of the above, plus:

- unique double or triple shelters based on passenger boardings;
- detailed schedule information including real time bus arrival information;
- regional system maps;
- bench(es) in shelters;
- bicycle racks.

Most BRT station stops will be located inside the road right-of-way along the corridor, unless they are located within a transit center to facilitate bus transfers and/or to enhance passenger safety. Locating station stops immediately adjacent to the road right-of-way decreases bus travel time and, when paired with other ITS technologies, is more efficient than locating stops off-line outside of the immediate road right-of-way. In some cases, easements on to private property or additional property may have to be acquired in order to safely locate stops within or immediately adjacent to the right-of-way. Ideally, BRT station stops should be located between 1/2 to 3/4 miles apart.

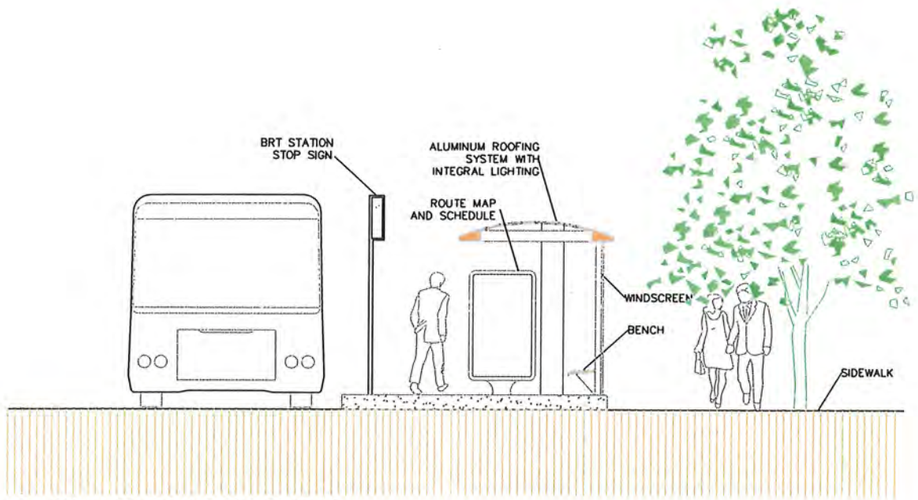
Stop design also is an important element in maintaining maximum operating efficiency and guaranteeing passenger safety. Platforms at the stops should be a minimum of one bus length long, but preferably longer to accommodate additional buses. This would enable passengers to effectively queue in order to expedite boardings and alightings. Stops should incorporate low maintenance, durable landscaping that does not block sight lines and offers protection from passing traffic.

Potential station stop designs follow on the next pages.

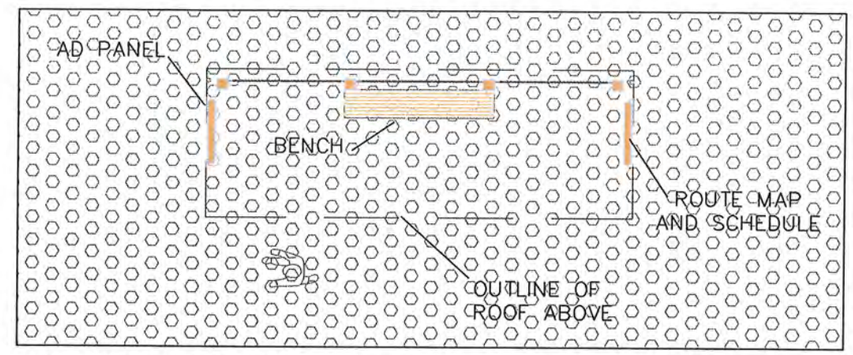
Amenities	Customer Boarding Activity Per Day		
	Bus Stops < 50	Enhanced Facility 50-300	Transit Center 300 +
Level Concrete Pad	•	•	•
Standard Shelter w/ Benches	•	•	•
Safe Access	•	•	•
Adequate Lighting	•	•	•
Bus Stop Signs	•	•	•
Route Map and Schedules	•	•	•
Trash Receptacle		•	•
System Map		•	•
Larger Capacity Shelters		•	•
Bike Racks		•	•
Real Time Travel Info		•	•
Telephones		•	•
Potential Conversion to Transit Center (Transit Store and Covered Waiting Areas)			•
Park and Ride Lots			•

US Route 1 - Fort Belvoir to Huntington Metrorail Station

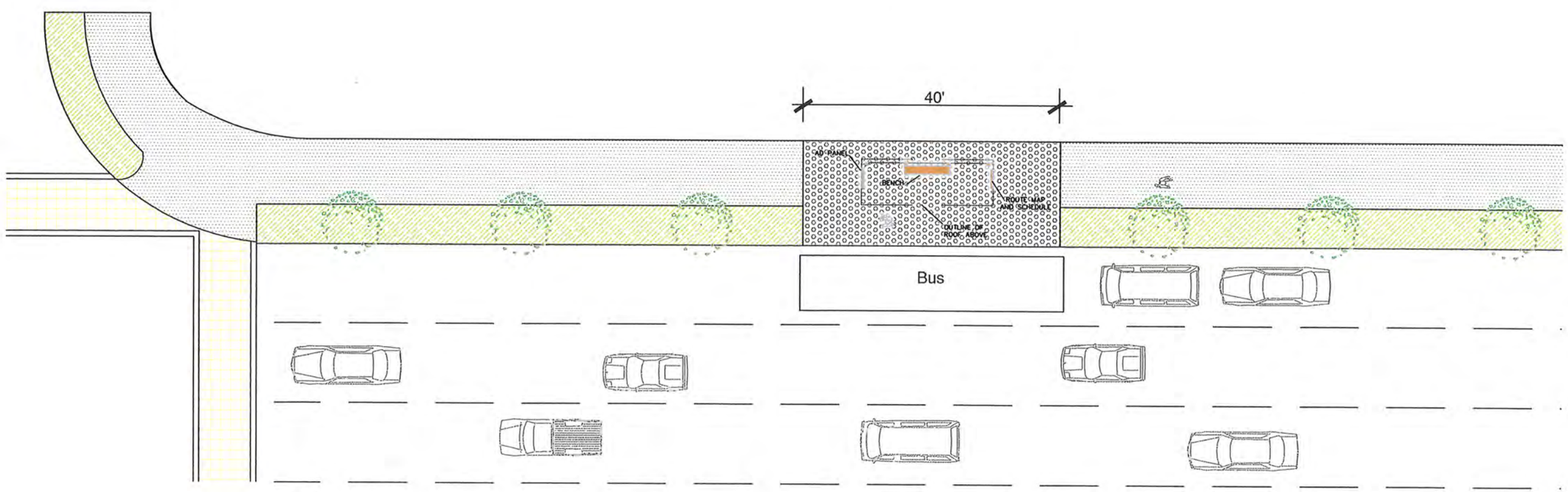
Typical On-Street Transit Stop



ELEVATION\SECTION



PLATFORM PLAN



PLAN

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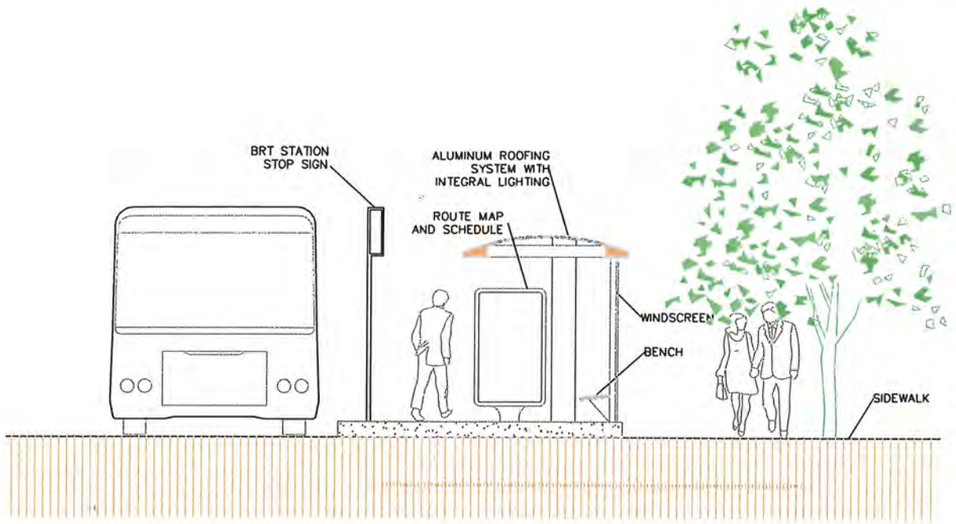
US Route 1 - Fort Belvoir to Huntington Metrorail Station

Typical BRT Pull-Out Concept



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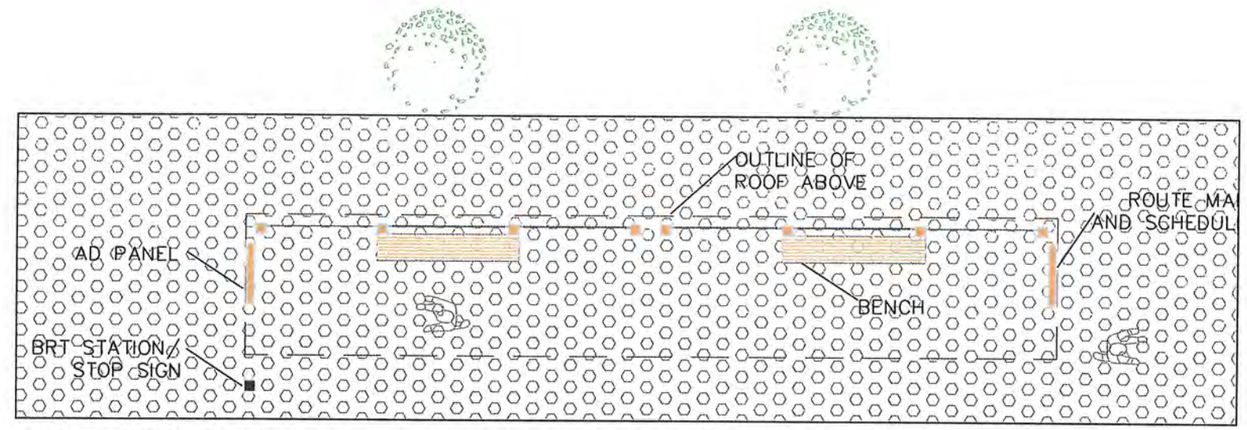
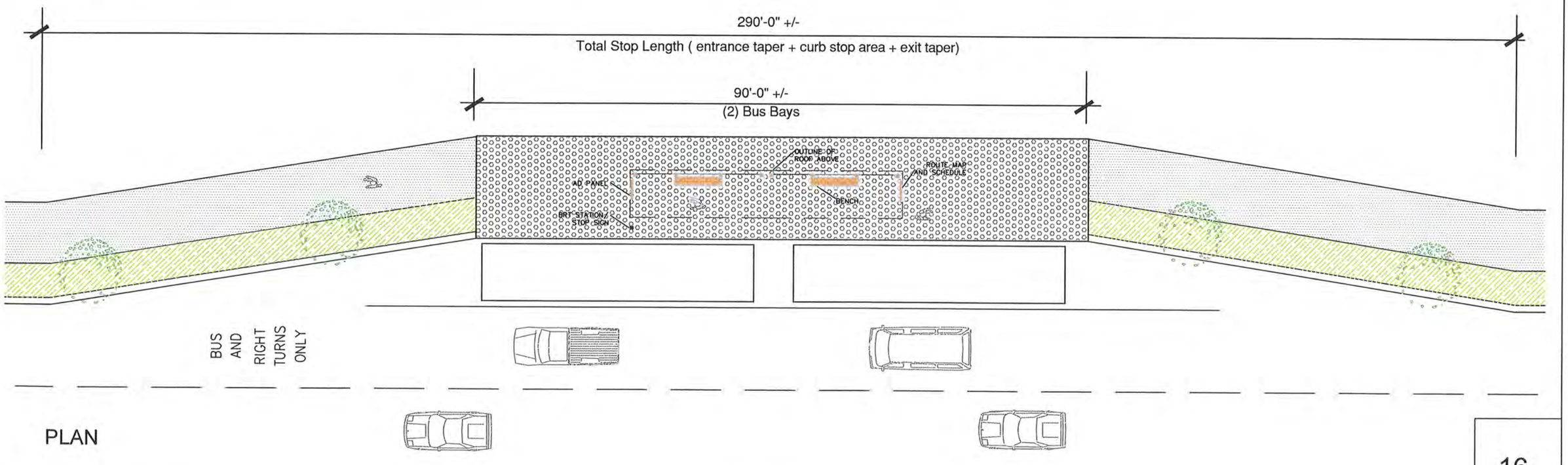


PLATFORM PLAN



PLAN

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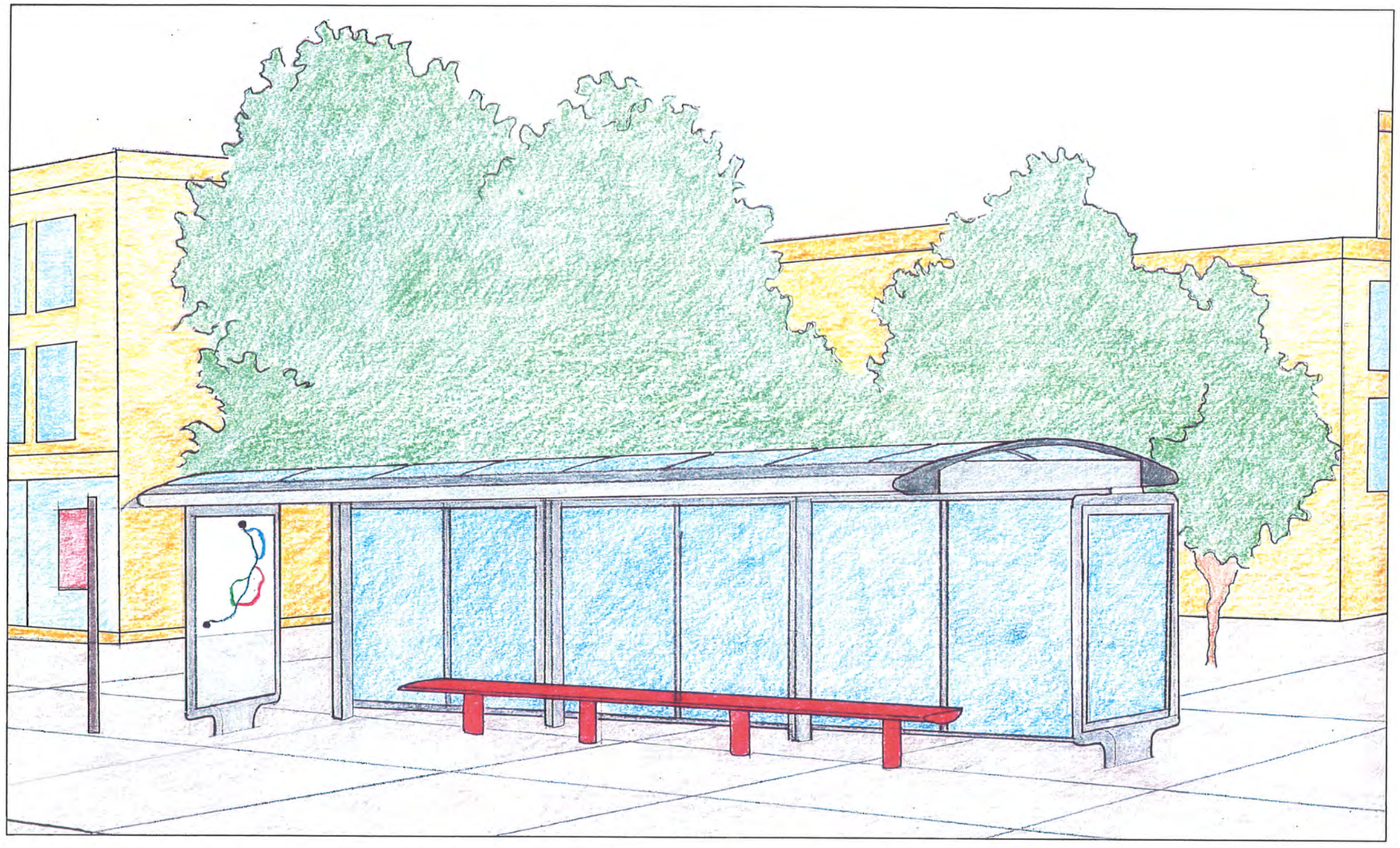
Typical Transit Shelter



This concept is based on the Cityscape 900 transit shelter, manufactured by Aluminium Structures. The Cityscape 900 transit shelter is modular in design and could serve as both the typical on-street bus stop as well as the enhanced BRT station stop.

This transit shelter has aluminium framing, lighting integrated in the structure and drainage concealed into the roof frame allowing drainage through the vertical supports. In addition to the transit shelter passenger amenities at the stop would include at a minimum:

- Safe pedestrian access
- Route map and schedule
- An adequate level of lighting to provide a safe environment
- Bus stop sign
- Trash receptacle

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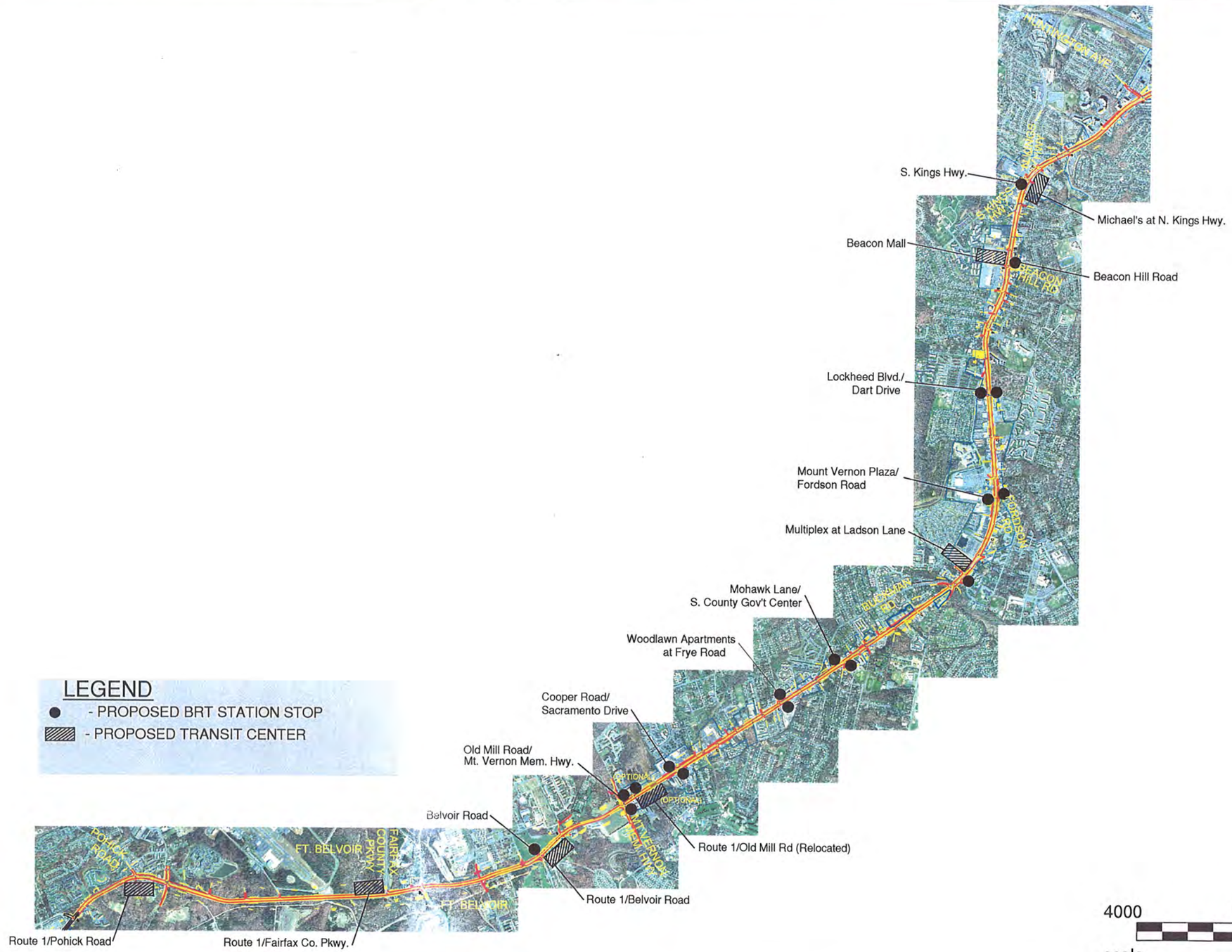
US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station



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4.2.1.1 Potential Stop Locations

Potential locations for BRT station stops along the Route 1 corridor are identified below. These stops would provide access for both the express BRT service as well as the local bus service along the corridor.

These locations were chosen based on the present and projected land use--including revitalization areas; existing demand at the current local bus stops; and proximity to activity centers along the corridor.

- *Belvoir Road at Fort Belvoir*
  Locate far side BRT station stops in both the north- and southbound directions. This requires providing a pull-out in the northbound direction. The northbound stop also could be located in the proposed Fort Belvoir transit center (central option B) should this site option be selected. Upgrade pedestrian crossings and provide a pedestrian signal.

- *Old Mill Road at Mount Vernon Highway*
  Locate far side BRT station stop in the northbound direction and locate near side BRT station stop in the southbound direction. This requires relocating the existing northbound bus stop closer to the signalized intersection. If the northern option for the Fort Belvoir Transit Center (Route 1 at Old Mill Road Relocated) is selected, a second option for this BRT stop would locate a far side stop in the northbound direction at this new location or off-road in the transit center, and a near side stop in the southbound direction. In either case, pedestrian crossings should be upgraded and a pedestrian signal should be added.

- *Cooper Road and Sacramento Drive*
  Locate near side BRT station stop in the northbound direction at Cooper Road utilizing the existing local bus stop location. Locate far side BRT station stop at Sacramento Drive in the southbound direction utilizing the existing local bus stop location. Upgrade pedestrian crossings and provide a pedestrian signal.

- *Woodlawn Apartments at Frye Road*
  Locate far side BRT station stop in the northbound direction utilizing the existing local bus stop location. Locate near side BRT station stop in the southbound direction utilizing the existing local bus stop location. Upgrade pedestrian crossings and provide a pedestrian signal.

- *Mohawk Lane/South County Government Center*
  Locate far side BRT station stops in both the north- and southbound directions utilizing the existing local bus stop locations. Upgrade pedestrian crossings and provide a pedestrian signal.

- *Ladson Lane*
  Locate near side BRT station stop in the northbound direction utilizing the existing bus stop. In the southbound direction, locate BRT station stop off-road in the Multiplex transit center. Upgrade pedestrian crossings and provide a pedestrian signal.

- *Mount Vernon Plaza/Fordson Road*
  Locate far side BRT station stops in both directions. Upgrade pedestrian crossings and provide a pedestrian signal.

- *Lockheed Boulevard and Dart Drive*
  Locate far side BRT station stop in the northbound direction utilizing the existing bus stop. Locate near side BRT station stop in the southbound direction utilizing the existing local bus stop locations. Upgrade pedestrian crossings and provide a pedestrian signal.

- *Beacon Hill Road at Beacon Mall*
  Locate far side BRT station stop in the northbound direction. Locate near side stop in the southbound direction or off-road in the Beacon Mall transit center.

- *Michael's at North King's Highway*
  Locate far side BRT station stop in the southbound direction and near side BRT station stop in the northbound direction or off-road in the transit center proposed at this location.

S:/planning&Development/PLDV-34 Route 1 VA/Revised Report/Intro_pages_rev_2_transit improvement options (continued)

4.2.2 Transit Centers and Park & Ride Lots/Structures

The ideal location and design concept for transit centers will vary widely as a function of the intended purpose. Some transit centers along the Route 1 corridor will provide Park & Ride access to BRT lines and other express commuter bus service and must have efficient road connections. Other transit centers along the corridor will facilitate high-quality transfer connections between local, express, rapid and circulator lines. Transit centers that serve several routes and facilitate multi-modal transfers also could support transit-oriented, economic development. These facilities must provide a convenient, safe, secure and attractive transfer environment.

Key criteria applied to plans for the proposed transit centers along the Route 1 corridor are:

High Activity Location: One of the keys to a transit center's success is locating it in a high activity area. These locations can provide a focal point for transit-oriented development and often generate transit trips. Examples of this type of location are: regional shopping centers, edge cities, traditional downtowns, suburban commercial concentrations, hospitals, and inter-city rail and bus locations.

High Transfer Volumes: A transit center should be located where high numbers of passengers currently transfer or are expected to transfer between and among various travel modes. This would be at the intersection of many routes and modes serving different markets and functions.

Accessibility to Adjacent Communities and the Transportation System: A successful transit center must be accessible to all transportation modes, including pedestrians, bicycles, automobiles (especially for those centers that have a Park & Ride or Kiss & Ride element to them) and neighborhood circulators. For a transit center that will predominantly serve auto access trips, high visibility and easy access/egress to major roadways also is important.

Safety and Security: These sites must provide a sense of security both for passengers and for parked cars and bicycles.

Transit Center Spacing: The spacing of transit centers is dependent upon the type of service and markets they are meant to support. Transit centers could be located at equal intervals based on bus running times or located at strategic commercial development sites to support a reasonably high level of transit service through or originating at the center.

Example of a transit center in high activity location

Example of a transit center with accessibility to the transportation system

S:/planning&Development/PLDV-34 Route 1 VA/Revised Report/Intro_pages_rev_2_transit improvement options (continued)

4.2.2.1 Potential Transit Center, Park & Ride and Bus Storage Facility Locations

Both the Regional Bus Study and the NVTC Study recommended several potential locations for transit centers and Park & Ride facilities along the Route 1 corridor to intercept vehicular trips, encourage high transit ridership, promote high-quality access to BRT, facilitate efficient transfer connections between local, express, rapid, and circulator lines and other express commuter bus service, and aid in community development. The preferred locations, bus bay and parking requirements for these potential transit centers will be determined at a later phase of the environmental assessment process and at the completion of the corridor transit service plan and the Fort Belvoir Master Plan.

Based on the recommendations of the above-mentioned studies, availability of vacant or underutilized properties, environmental inventory and field reconnaissance, the following transit center sites, bus bay requirements and parking projections are proposed for planning purposes.

Conceptual design plans for these transit centers follow each site description and show transit center layouts including access roads, Park & Ride facilities, pedestrian walkways, bus bays, bus shelters with canopies and transit stores. Transfer environments are designed to be convenient, safe, secure and attractive. Factors that influenced the locations identified for these transit centers include:

- Proximity to major trip generators, Metrorail, VRE, and existing and planned local bus stops
- Access to existing and planned development and county designated revitalization areas
- Proximity to existing and planned signalized intersections
- Geometrics
- Favorable land use and environmental conditions

Fort Belvoir Area

In the Fort Belvoir area, four locations have been selected as potential transit center sites. It is envisioned that at least one site will be chosen.

1) Southern Option at Route 1/Pohick Road intersection

This site currently is undeveloped and located on private land on the west side of Route 1 opposite its intersection with Pohick Road. This site was chosen for its potential to intercept vehicular traffic coming from the south along Route 1 and I-95, and from the west along Lorton Road and Pohick Road. This proposed facility could provide a key transfer point for bus services operating on Route 1 and bus services to/from major trip generators such as the Lorton VRE and Amtrak stations, the proposed Lorton Multi-use Complex and the Franconia-Springfield Metrorail Station.

Additionally, the Regional Bus Study recommended this site for a new bus storage/maintenance facility to provide relief to existing facilities and to support the proposed bus priority corridors. The Bus Study chose this particular site at the southern terminus of the Route 1 BRT corridor to avoid the need for buses to dead-head approximately 10 miles north to access the existing Four Mile Run bus garage and to support future local and express intercounty transit connections between Fairfax and Prince William Counties.

As a combined terminal and transit center, this site would require a 6-bay off-road bus facility, a 1500-space parking structure, HOV and Kiss & Ride parking, covered waiting areas, a transit store and a bus storage/maintenance facility for 125-150 buses.

2) Central Option (A) at Route 1/Fairfax County Parkway[1]

This site--located on Fort Belvoir federal land in the southwest corner of the Route 1/Fairfax County Parkway intersection, also has been identified as potential terminal transit center location. It would incorporate a 6-bay off-road bus facility, a 1500-space parking structure, HOV and Kiss & Ride parking, covered waiting areas, a transit store and a bus storage/maintenance facility for 125-150 buses.

This site was chosen for its potential to intercept vehicular traffic coming from the south along Route 1 and I-95, and from the west along Fairfax County Parkway. In addition, this site could serve as part of a multimodal transit center should the Metrorail Blue Line or a light-rail line be extended from the Franconia-Springfield Metrorail Station to Fort Belvoir. It also could provide a key transfer point for bus services operating on Route 1 and bus services to/from major trip generators such as Fort Belvoir and the Franconia-Springfield Metrorail Station.

3) Central Option (B) at Route 1/Belvoir Road[2]

This site located on Fort Belvoir land in the southeast corner of the Route 1/Belvoir Road intersection, also has been identified as a potential transit center location. The site would include a 4-bay off-road bus facility, covered waiting areas and a transit store, but would have no parking facilities. The site was chosen for its proximity to the Fort Belvoir Visitor's Center and the proposed Army Museum, as well as its potential to permit an interface between public areas and secure areas on Fort Belvoir grounds. It also provides a prime location for connecting public transit service to any secure circulators proposed to serve the Fort Belvoir grounds.

4) Northern Option at Route 1/Old Mill Road (Relocated)

This third undeveloped site--located on private land at the northeast corner of the Route 1/ Old Mill Road (relocated) intersection, also has been identified as a potential location for a transit center. It would include a 4-bay off-road bus facility, a 1500-space parking structure, HOV and Kiss & Ride parking, covered waiting areas and a transit store. This site was chosen for its potential to intercept vehicular traffic coming from the south along Route 1 and from the east along Mount Vernon Highway. As with the other transit center options proposed for the Fort Belvoir area, this site could serve as a key transfer point for bus services operating on Route 1 and bus services to/from major trip generators such as Fort Belvoir, the Franconia-Springfield Metrorail Station and Mount Vernon Estate historic site.

[1, 2] The Fort Belvoir military base currently is updating its Master Plan to reflect the locations of planned development and the impact such development will have on the transportation network. Therefore, the proposed location of the transit center could change pending the completion of the master plan and further discussion with base officials.

US Route 1 - Fort Belvoir to Huntington Metrorail Station

NOTE: THIS DRAWING HAS BEEN PREPARED TO DEMONSTRATE THE BASIC FEASIBILITY OF THE CONCEPT PRESENTED. THE CONCEPT IS SUBJECT TO FURTHER REFINEMENT AND MAY BE REVISED DURING FUTURE PLANNING AND/OR ENGINEERING DESIGN PHASES OF THE PROJECT. THE ENVIRONMENTAL PLANNING PROCESS MAY INCLUDE ONE OF THESE ALTERNATIVES ALONG WITH OTHERS PRIOR TO ANY DECISION REGARDING IMPLEMENTATION OF A SPECIFIC PLAN WHICH WILL BE SUBJECT TO PROFESSIONAL ENGINEERING DESIGN PRINCIPLES AS WELL AS WMATA's DESIGN AND PERFORMANCE CRITERIA.

Ft. Belvoir Transit Center - Southern Option

0 75' 125'
Scale feet

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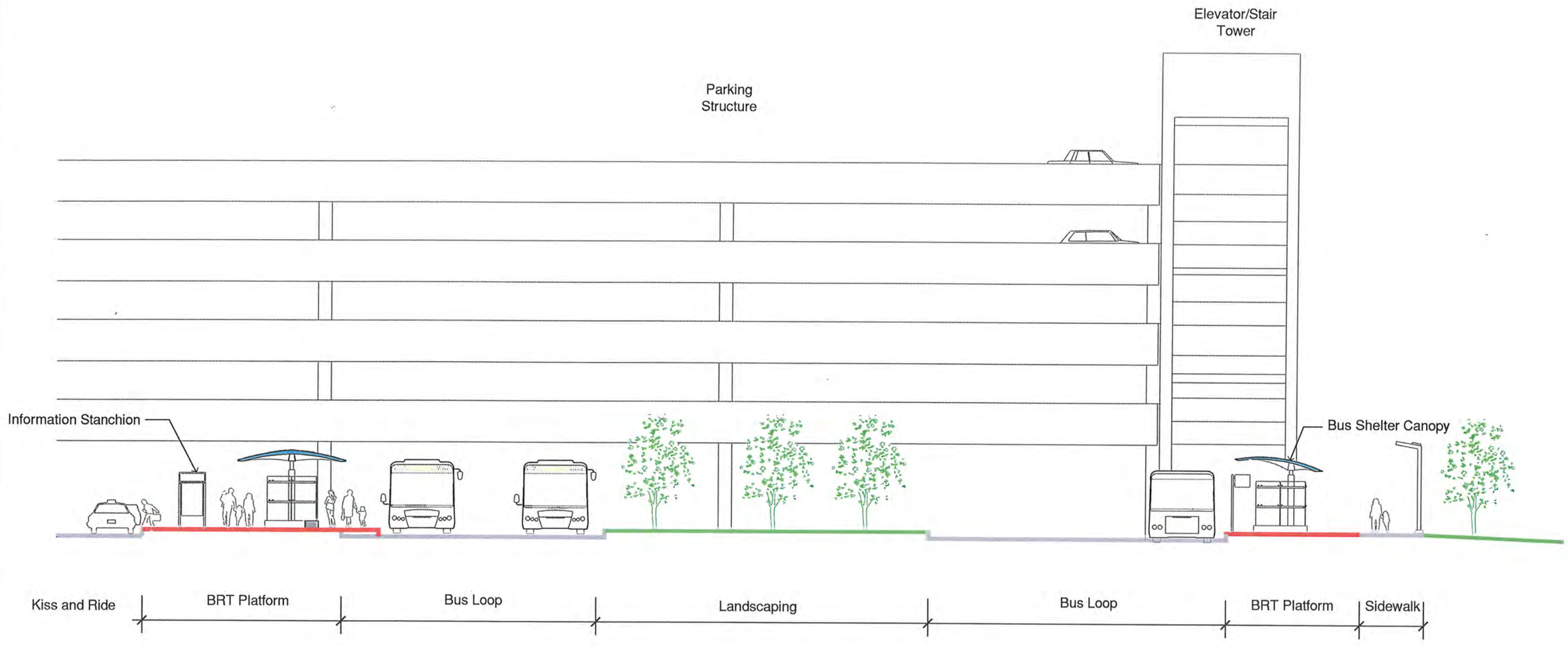
US Route 1 - Fort Belvoir to Huntington Metrorail Station



Typical Cross Section at Ft. Belvoir Transit Center - Southern Option

0 7.5' 15'
Scale feet

US Route 1 - Fort Belvoir to Huntington Metrorail Station

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Ft. Belvoir Transit Center - Central Option A

0 75' 125'
Scale feet

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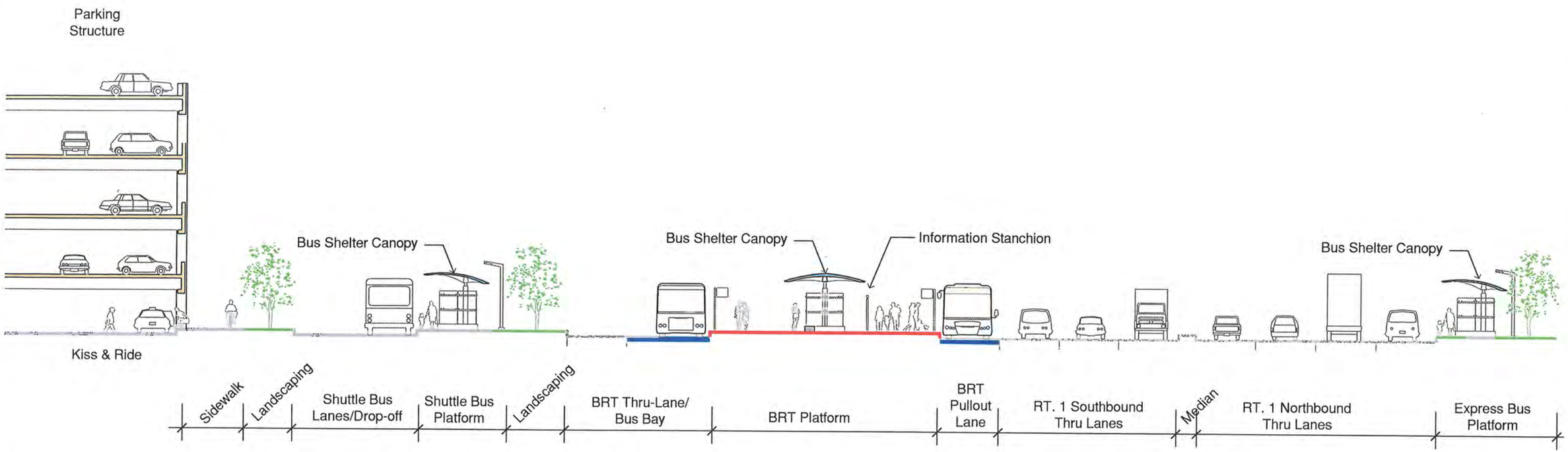
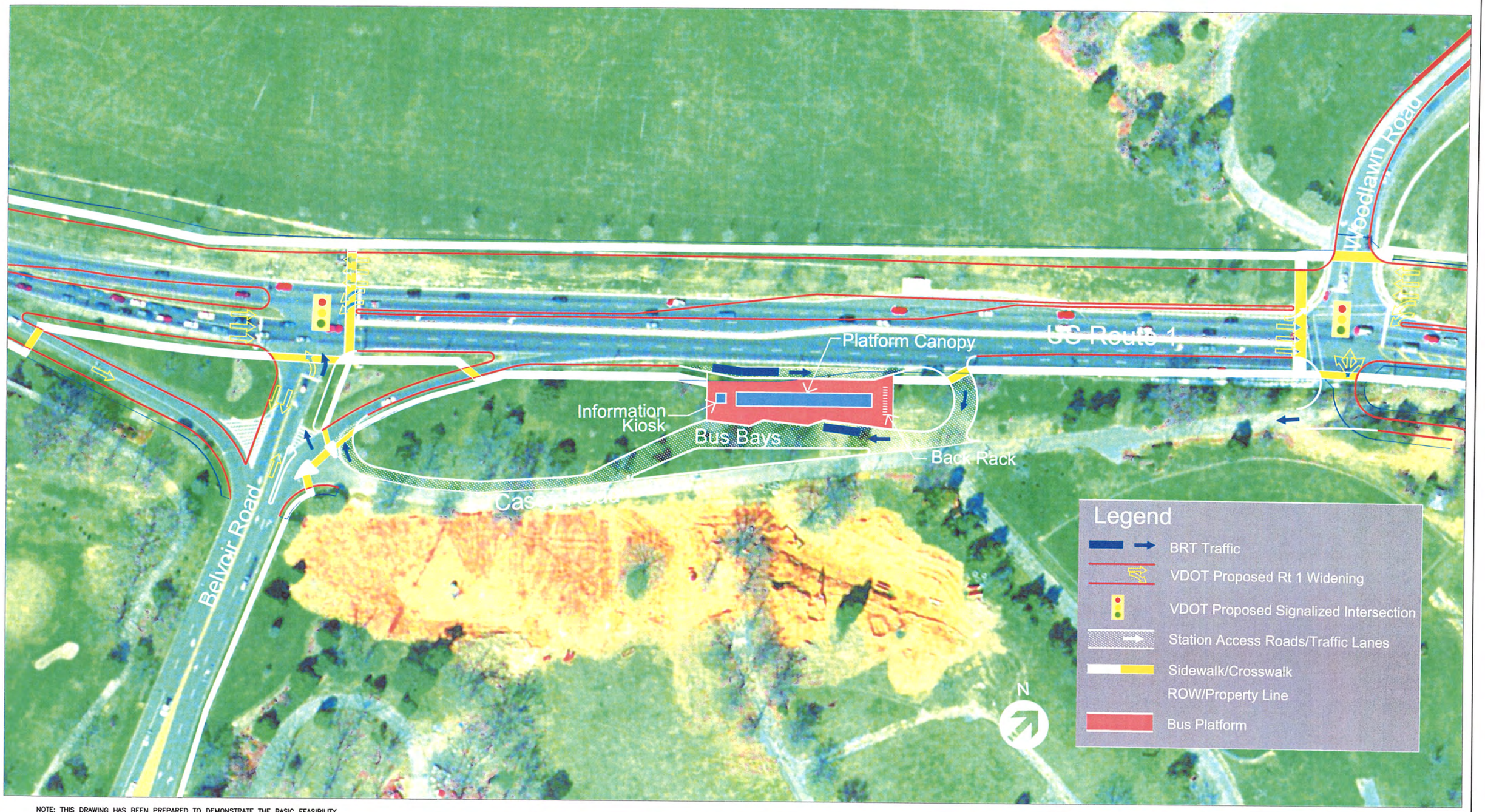


Typical Cross Section at Ft. Belvoir Transit Center at Fairfax County Parkway - Central Option A

0 10' 20'
Scale feet

US Route 1 - Fort Belvoir to Huntington Metrorail Station



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Belvoir Road Transit Center - Central Option B

0 75' 125'
Scale feet

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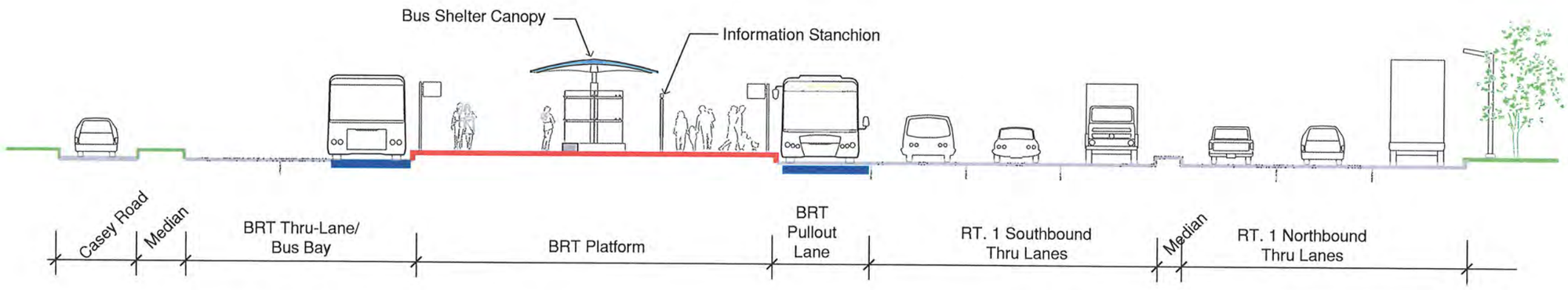
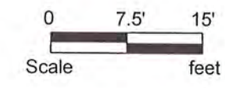
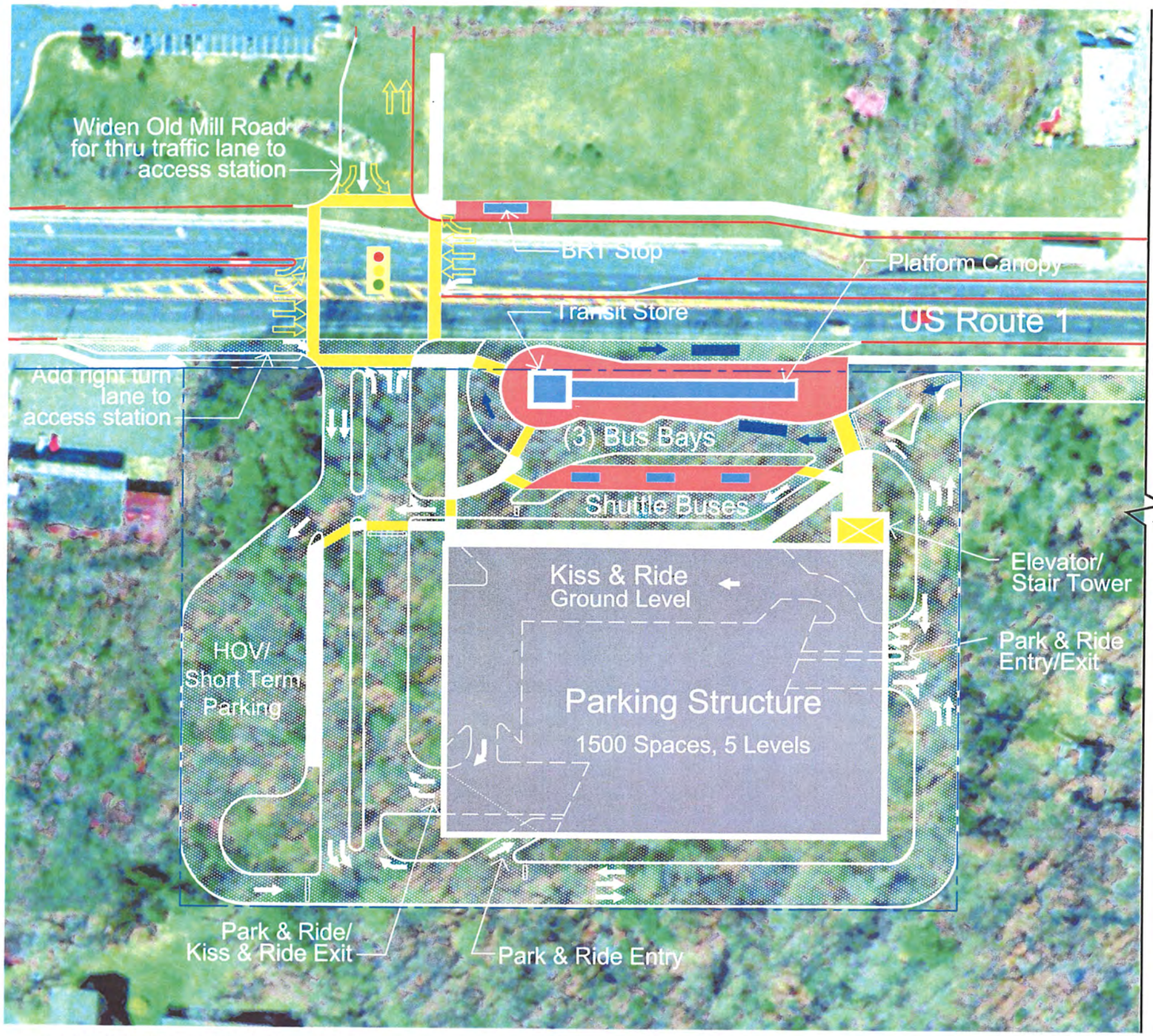
US Route 1 - Fort Belvoir to Huntington Metrorail Station



Typical Cross Section at Ft. Belvoir Transit Center at Belvoir Road - Central Option B



US Route 1 - Fort Belvoir to Huntington Metrorail Station



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Ft. Belvoir Transit Center - Northern Option

0 50' 100'
Scale feet

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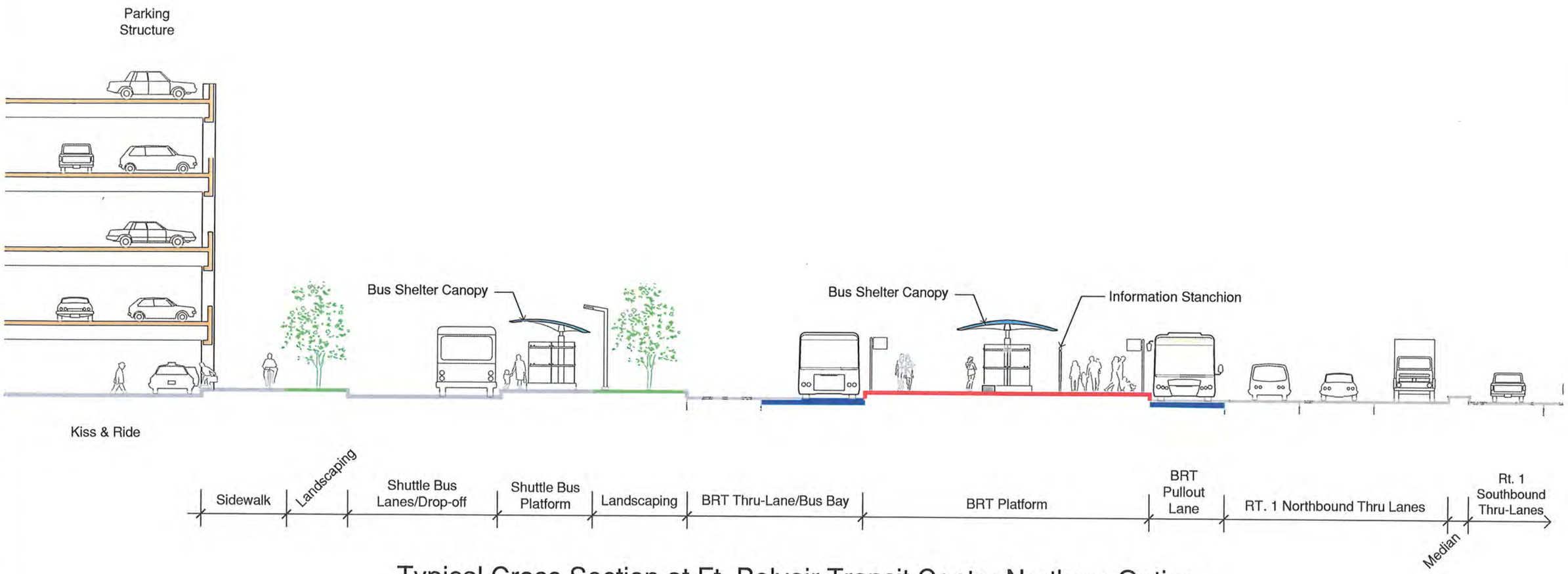
US Route 1 - Fort Belvoir to Huntington Metrorail Station



Typical Cross Section at Ft. Belvoir Transit Center Northern Option

0 7.5' 15'
Scale feet

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Multiplex at Ladson Lane

The NVTC Study recommended using this site, located in the northwest corner of the Route 1/Ladson Lane intersection, primarily for a Park & Ride facility for transit riders from the areas east of Route 1 who might use planned express bus service to/from the Huntington Metrorail Station. This study recommends that 200-300 existing surface spaces at the underutilized Multiplex parking lot be used for commuter parking in the short term until a 500-space parking structure can be built as part of the property's redevelopment. This transit center would provide a station stop for north- and southbound BRT buses and a high-quality transfer point between Metrobus and Fairfax Connector services providing connections to and from Mount Vernon Hospital and other nearby major generators. To accommodate the proposed service, a 4-bay off-road bus facility with covered waiting areas, a transit store, pedestrian connections and other passenger amenities are proposed at the site.

Another option, to avoid the need for northbound BRT buses to turn left from Route 1 in order to access the transit center, is to provide a two-bus pull-out with enhanced bus shelters and other passenger amenities at the near side of the Route 1/ Ladson Lane intersection. However, passengers who want to reach the transit center or Park & Ride facilities on the other side must cross Route 1 to get there.

The Regional Bus Study suggests this site as the main transfer point from the neighborhood circulator service to the *RapidBus* service. At least four of the six circulators would serve this transit center.

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US Route 1 - Fort Belvoir to Huntington Metrorail Station

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Multiplex Cinema Transit Center at Ladson Lane

0 50' 100'
Scale feet

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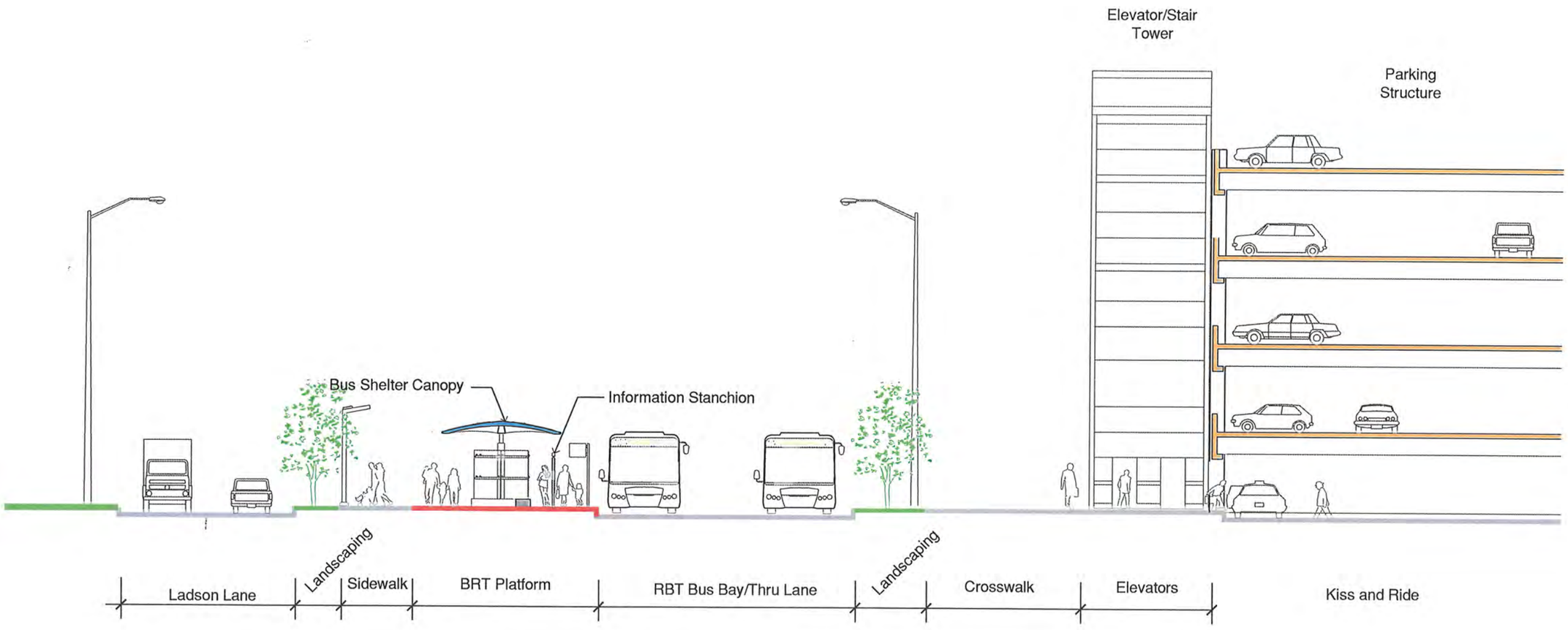
US Route 1 - Fort Belvoir to Huntington Metrorail Station



Typical Cross Section at Multiplex Transit Center at Ladson Lane

0 7.5' 15'
Scale feet

Beacon Mall

Both the NVTC Study and the Regional Bus Study recommended the site at Beacon Mall for a major transit center since it is a heavy trip generator and would eliminate the need for transit passengers to cross Route 1 while traveling to and from the mall. To promote additional transit ridership, this study recommends that 200-300 existing surface spaces at the moderately used parking lots be utilized in the short term until a 500-space parking structure can be built as part of the property's redevelopment. To provide station stops for north- and southbound BRT buses and an efficient transfer point between north-south and east-west Metrobus and Fairfax Connector bus services, a 2-bay off-road bus facility[3] and a 2-bay pull-out with enhanced shelters, an information kiosk, pedestrian connections and other passenger amenities are proposed at the site.

Another option, to avoid the need for northbound BRT buses to turn left from Route 1 in order to access the transit center, is to provide a two-bus pull-out with enhanced bus shelters and other passenger amenities at the far side of the Route 1/Beacon Hill Road intersection. However, passengers who want to reach the transit center or Park & Ride facilities on the other side must cross Route 1 to get there.

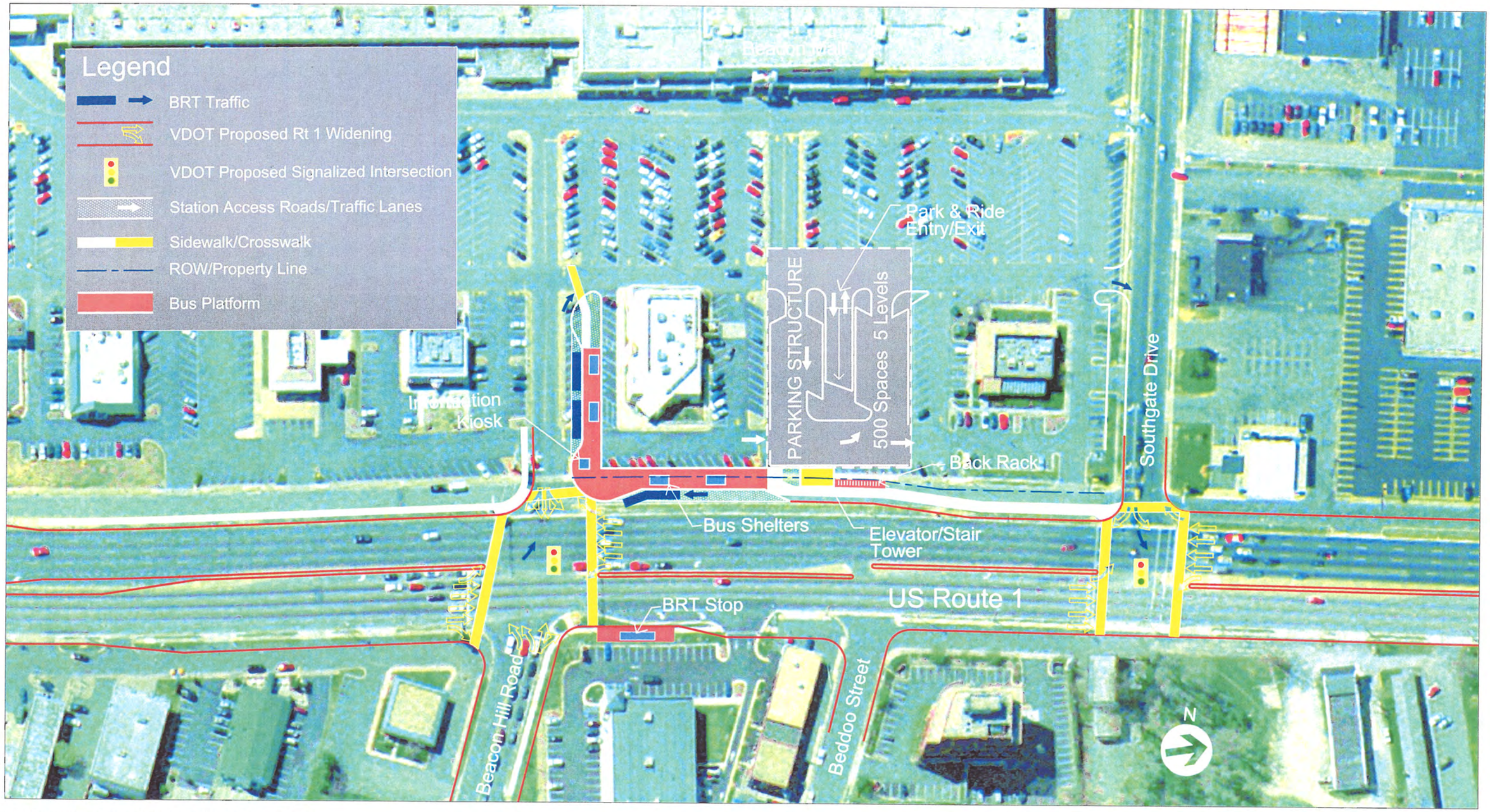
Michael's at North King's Highway

As with the Multiplex at Ladson Lane site, the NVTC Study also recommended using this site, which is located on the east side of Route 1/Kings Highway intersection, primarily as a Park & Ride facility with transit connections to the Huntington Metrorail Station. To attract transit riders from the areas east and west of Route 1 to the planned express bus service to and from the Huntington Metrorail Station, this study recommends that 200-300 existing surface spaces of the underutilized Michael's parking lot be used in the short term as overflow commuter parking for the Huntington Metrorail Station, until a 500-space parking structure can be built as part of the property's redevelopment. To provide station stops for north- and southbound BRT buses, and an efficient transfer point between north-south and east-west Metrobus and Fairfax Connector bus services, recommendations for this site include: a 4-bay off-road bus facility with covered waiting areas, a transit store, pedestrian connections and other passenger amenities.

Another design option for this site, to avoid the need for northbound BRT buses to turn left from Route 1 in order to access the transit center, is to provide a two-bus pull-out with enhanced bus shelters and other passenger amenities at the far side of the Route 1/Kings Highway intersection. However, passengers who want to reach the Transit Center or Park & Ride facilities on the other side must cross Route 1 to get there.

3 Since the proposed site currently is improved with fast food restaurants, only two bus bays can currently be accommodated.

US Route 1 - Fort Belvoir to Huntington Metrorail Station



NOTE: THIS DRAWING HAS BEEN PREPARED TO DEMONSTRATE THE BASIC FEASIBILITY OF THE CONCEPT PRESENTED. THE CONCEPT IS SUBJECT TO FURTHER REFINEMENT AND MAY BE REVISED DURING FUTURE PLANNING AND/OR ENGINEERING DESIGN PHASES OF THE PROJECT. THE ENVIRONMENTAL PLANNING PROCESS MAY INCLUDE ONE OF THESE ALTERNATIVES ALONG WITH OTHERS PRIOR TO ANY DECISION REGARDING IMPLEMENTATION OF A SPECIFIC PLAN WHICH WILL BE SUBJECT TO PROFESSIONAL ENGINEERING DESIGN PRINCIPLES AS WELL AS WMATA's DESIGN AND PERFORMANCE CRITERIA.

Beacon Mall Transit Center

0 50' 100'
Scale feet

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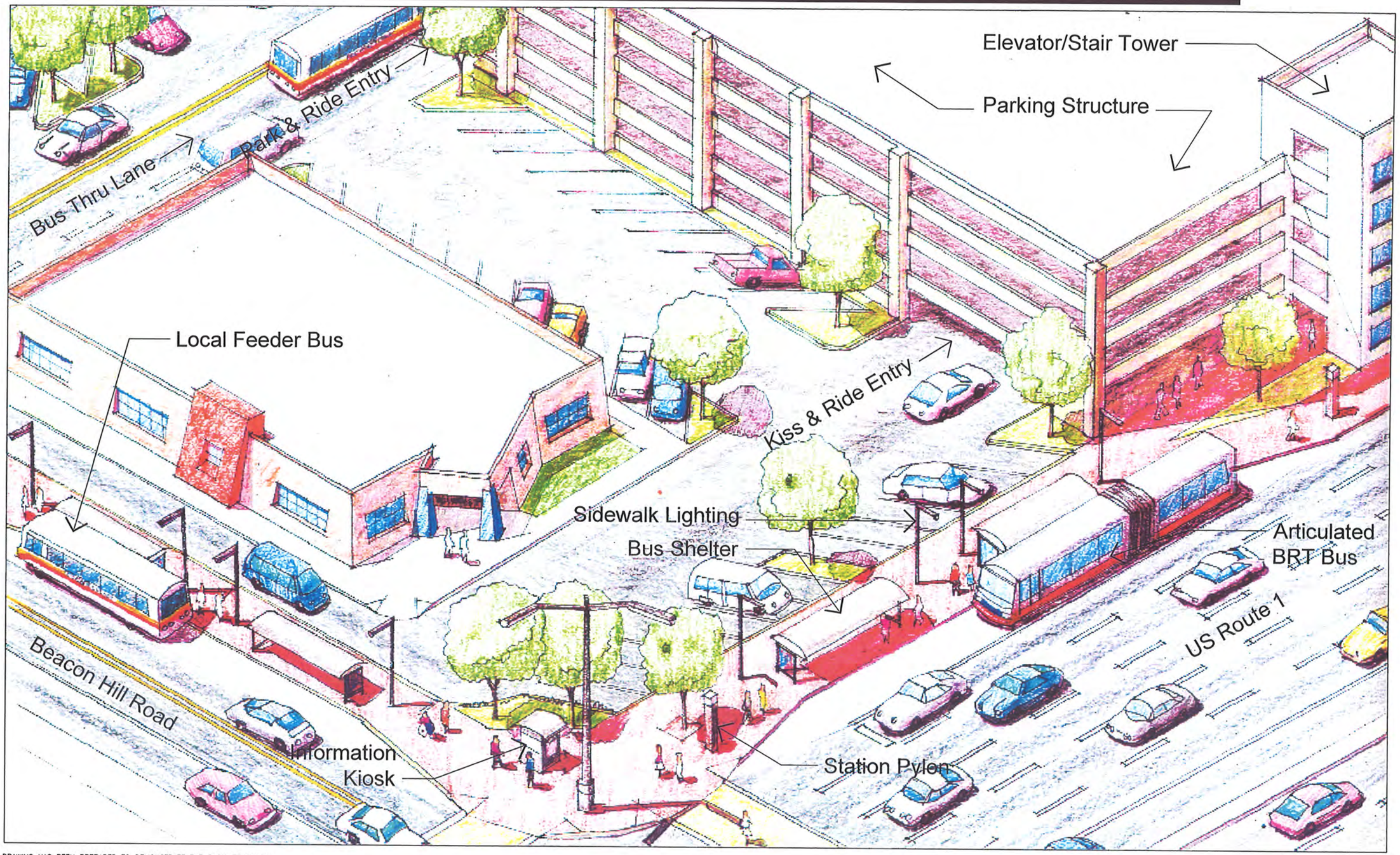
US Route 1 - Fort Belvoir to Huntington Metrorail Station



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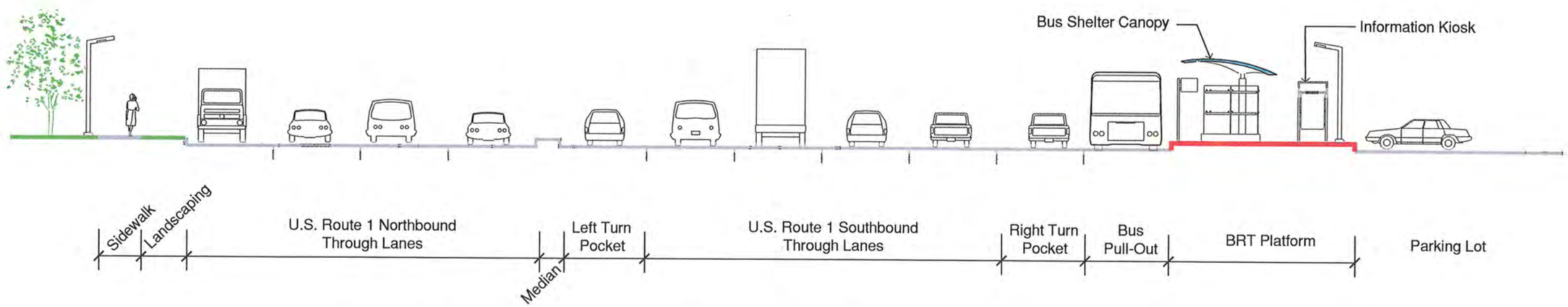
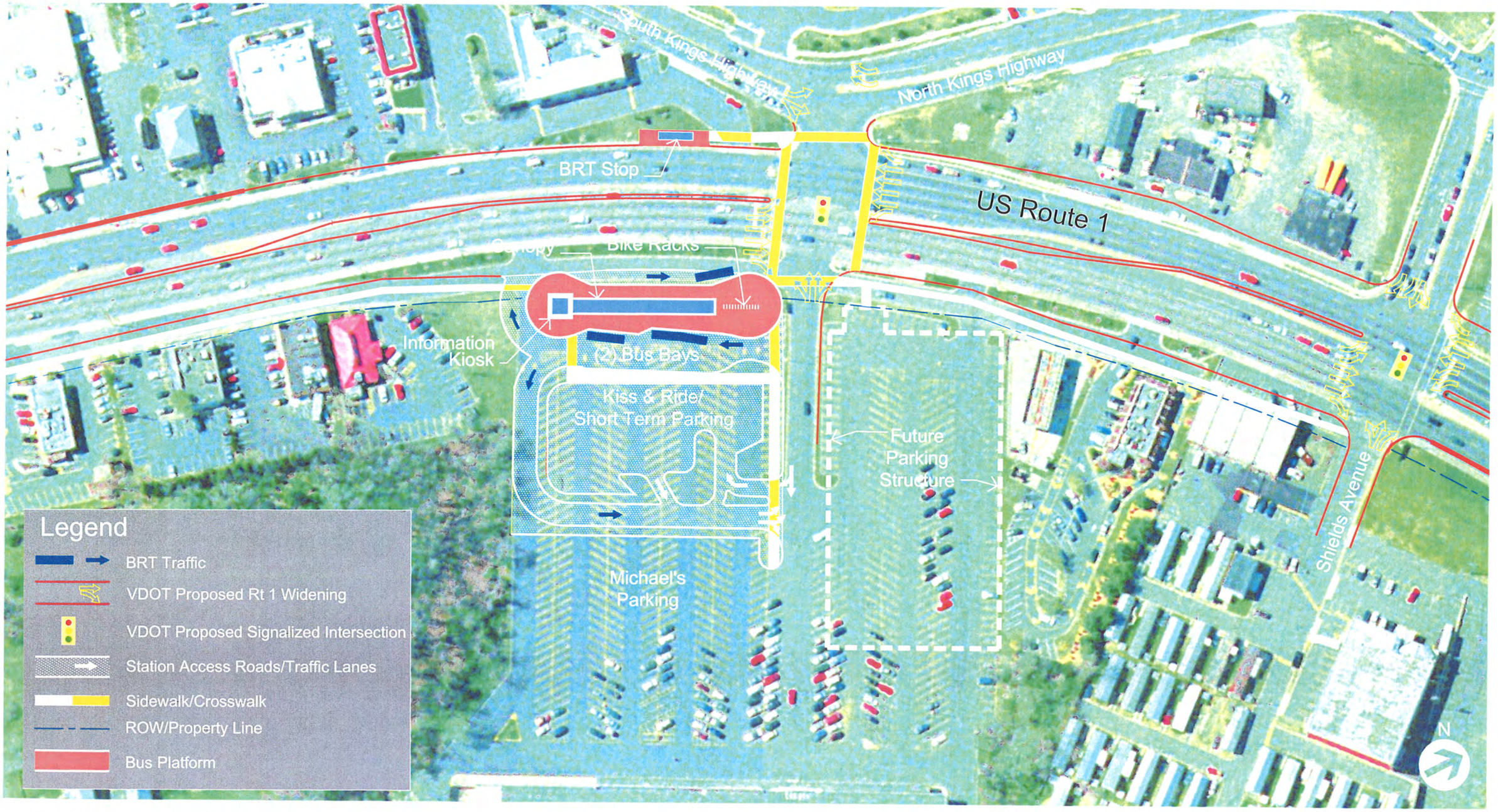
Beacon Mall Transit Center



Typical Cross Section at Beacon Mall Transit Center

0 7.5' 15'
Scale feet

US Route 1 - Fort Belvoir to Huntington Metrorail Station



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Kings Highway Transit Center

0 50' 100'
Scale feet

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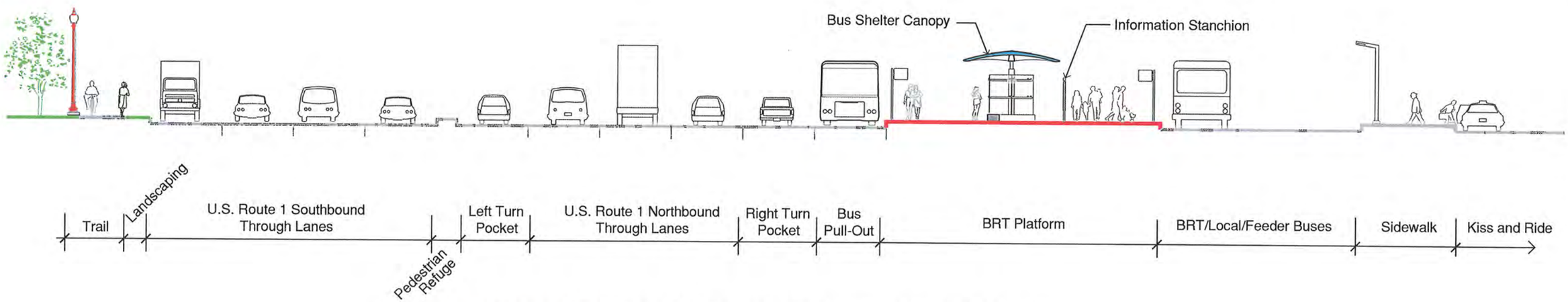

Typical Cross Section at King's Highway Transit Center

0 10' 20'
Scale feet

S:/planning&Development/PLDV-34 Route 1 VA/Revised Report/Intro_pages_rev_2_transit improvement options (continued)

4.3 Frequency & Demand for Service

Table 2 compares the frequency of service under the three phases. The existing bus service in the Route 1 corridor operates a combined 11 bus trips in the peak hour, or one bus every 5.5 minutes. If the Fairfax Connector routes 101-103 are included, the average headway drops to 3.8 minutes.

Phase 1: Enhanced Bus Service
This phase assumes that the NVTC Study recommendations have been implemented. Average headway along the Route 1 trunk lines drops from 5.5 minutes to 3.8 minutes.

Phase 2: BRT
This phase assumes *RapidBus* and circulator service levels as recommended in the Regional Bus Study. It also assumes that Fairfax Connector service in the corridor has been replaced by the circulators and that Metrobus route 9A has been shortened to exclude a low ridership segment between Fort Belvoir and Lorton, with a new shuttle service filling any transit void there. Average headway along the Route 1 trunk lines drops from 3.8 minutes to 1.8 minutes. Running the service in priority lanes will increase service speed.

Phase 3: Light Rail Transit
The LRT phase assumes peak period headways of 7.5 minutes and reduces headways for trunk line service from 1.8 minute to 1.7 minutes.

Table 3 presents an analysis of ridership potential in the corridor under different scenarios. The number of corridor transit trips in the 2025 CLRP scenario was developed using MWCOG travel model projections. These demand estimates are not precise, but have been generated to provide a very broad-brush look at potential ridership for the proposed service levels.

Based on the existing bus ridership, it is estimated that a little under half of the transit riders in the corridor use bus; the remainder of the transit trips are made by people that access the Metrorail system by automobile or on foot. Using bus ridership data for Route 9A and Route 105, it appears that roughly 70 percent of the bus trips in the corridor are on routes that stay on Route 1. Other bus riders are on feeder routes. Existing ridership potential (shown as scenario1) for a transitway in the Route 1 corridor is about 5,000 passengers daily.

Scenario 2 examines the impact of growth in trips from 2000 to 2025. Based on MWCOG forecasts, trips are projected to grow by 70 percent, so the resulting transitway ridership potential grows to 8,800.

Scenario 3 adds in the impact of increased employment at Fort Belvoir not included in the MWCOG forecasts. Assuming an additional 12,000 workers and 20 percent transit mode share, the transitway ridership potential increases to 10,000.

Scenario 4 considers what would happen if improved transit service increased the share of Metrorail trips that arrive to the station on bus. The shift from Metrorail auto access to bus access increases the bus percentage in the corridor but does not raise the total number of transit trips. Transitway ridership potential increases to 14,000.

Table 2: Transit Service Frequency in Route 1 Corridor

	Existing		Phase 1 Enhanced Bus		Phase 2 BRT		Phase 3 LRT	
Routes	Hdwy	Pk Hr Trips	Hdwy	Pk Hr Trips	Hdwy	Pk Hr Trips	Hdwy	Pk Hr Trips
Existing Routes:								
Metrobus 9A	20	3	20	3	15	4	15	4
Fairfax Connector								
105	15	4	12	5	–	–	–	–
106	30	2	30	2	–	–	–	–
107	30	2	15	4	–	–	–	–
Proposed Routes:								
105X			30	2				
Circulator 1					15	4	15	4
Circulator 2					15	4	15	4
Circulator 3					15	4	15	4
Circulator 4					15	4	15	4
Circulator 5					15	4	15	4
Lorton Shuttle					15	4	15	4
BRT/*RapidBus*					10	6		
LRT							7.5	8
Trunkline Service	5.5	11	3.8	16	1.8	34	1.7	36
Feeder Routes:								
101	30	2	30	2				
102	30	2	30	2				
103	60	1	30	1				
Feeder Service	12.0	5	12.0	5				
Total in Corridor	3.75	16	2.9	21	1.8	34	1.7	36

Table 3: Potential Transit Demand in the Route 1 Corridor

Scenario	Corridor Transit Trips	% of Corridor Transit Trips By Bus	Bus Riders	% of Bus Riders Using Rte.1 Line-Haul	Potential Transitway Riders
(1) Existing	16,300	45%	7,350	70%	5,000
(2) 2025 CLRP	27,700	45%	12,500	70%	8,800
(3) 2025 Scen.2 + Additional Ft. Belvoir Workers	32,000	45%	14,400	70%	10,000
(4) 2025 Scen.3 + Shift from Metro Drive-Access to Bus	32,000	55%	17,600	80%	14,000
(5) 2025 Scen.4 + Shift from Auto Mode to Transit Mode	37,300	55%	20,500	80%	16,400

NOTES:

(1) Only includes trips to DC/Arlington/Alexandria
(3) Assumes + 12,000 workers * 1.6 trips/day * 20% transit share=4,300 trips
(5) Assumes transit mode share increase from 23% to 27%

Scenario 5 assumes that improved transit service in the corridor leads to some shift from auto mode to transit mode, increasing the number of transit trips in the corridor. Transitway ridership potential increases to 16,400.

As demand grows, the system should expand from the enhanced fixed service to BRT eventually to LRT. In many cases, LRT can be justified at the demand level of Scenario 4.

Upon selection of an implementation plan, a complete operating plan and capital program plan must be developed and approved by funding agencies.

4.4 Alignments

The only alignment considered for BRT service on Route 1 at this time is a curb lane alignment sharing lanes with traffic. In this alignment, buses will share the curb lane with either mixed traffic or vehicles making right turns and (possibly) high occupant vehicles. Curb alignments are less expensive to build and have fewer environmental impacts than median alignments because, in most cases, it simply requires a lane designation with special paint treatment and signage. However, side alignments do not operate as effectively as dedicated or exclusive running way alignments where the exclusive lanes are either depressed or elevated at major intersections.

The following pages provide plans for the potential alignment and design schematics for the roadway cross-sections.

S:/planning&Development/FLDV-34 Route 1 VA/Revised Report/Intro_pages_rev_2_transit improvement options (continued)

US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station

N

FOR CONTINUATION SEE SHEET NO.

LEGEND

- LOCAL BUS STOP
- PROPOSED BRT STATION STOP
- PROPOSED TRANSIT CENTER
- PROPOSED WIDENING PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION
- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

200 0 100 200
scale feet

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US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station

LEGEND

- LOCAL BUS STOP
- PROPOSED BRT STATION STOP
- PROPOSED TRANSIT CENTER
- PROPOSED WIDENING PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION
- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

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scale feet

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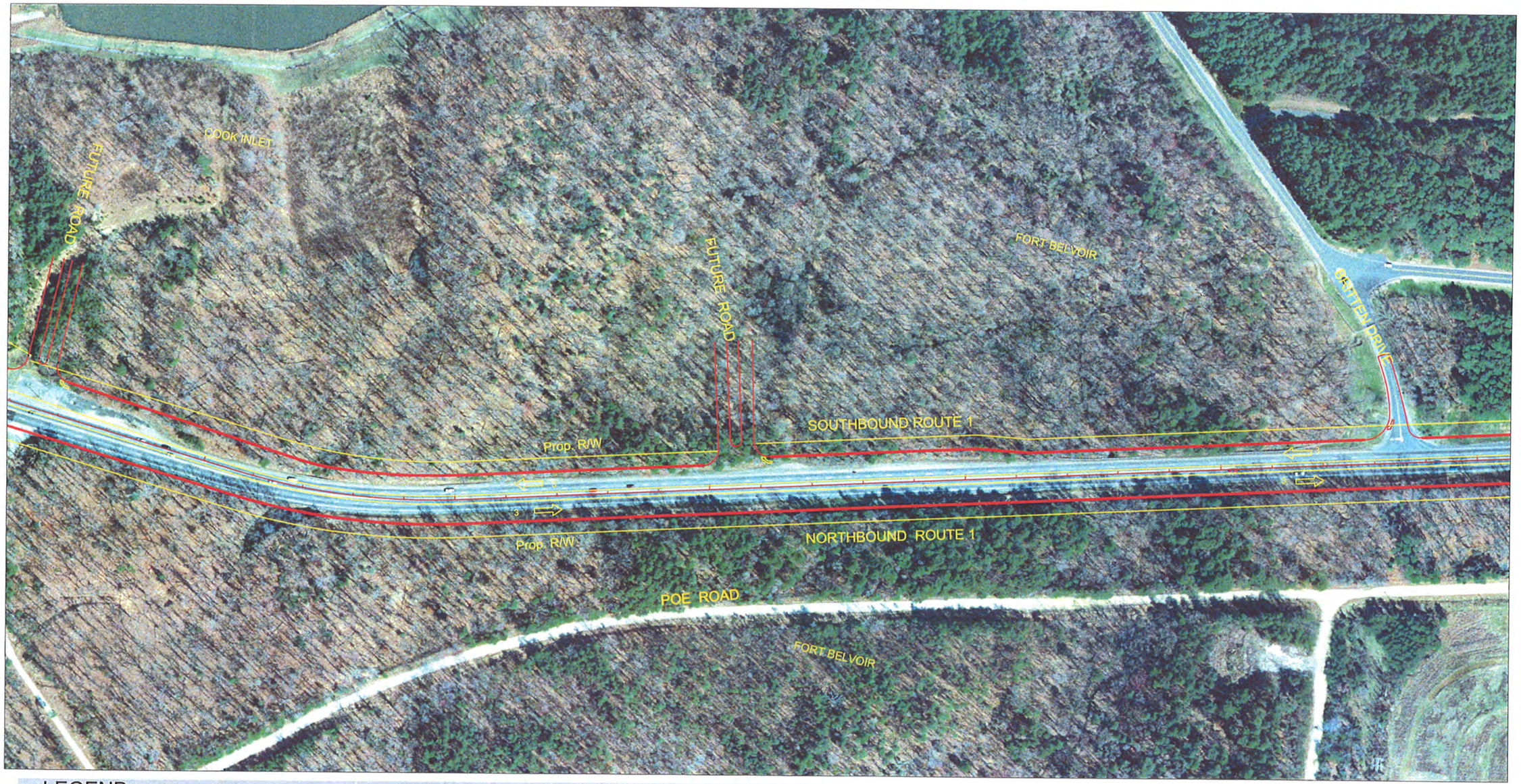
US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station



LEGEND

- LOCAL BUS STOP
- PROPOSED BRT STATION STOP
- PROPOSED WIDENING PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION
- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

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scale feet

US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station

LEGEND

- LOCAL BUS STOP
- PROPOSED BRT STATION STOP
- PROPOSED WIDENING PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION
- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

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scale feet

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US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station

LEGEND

- LOCAL BUS STOP
- PROPOSED BRT STATION STOP
- PROPOSED WIDENING PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION
- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

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scale feet

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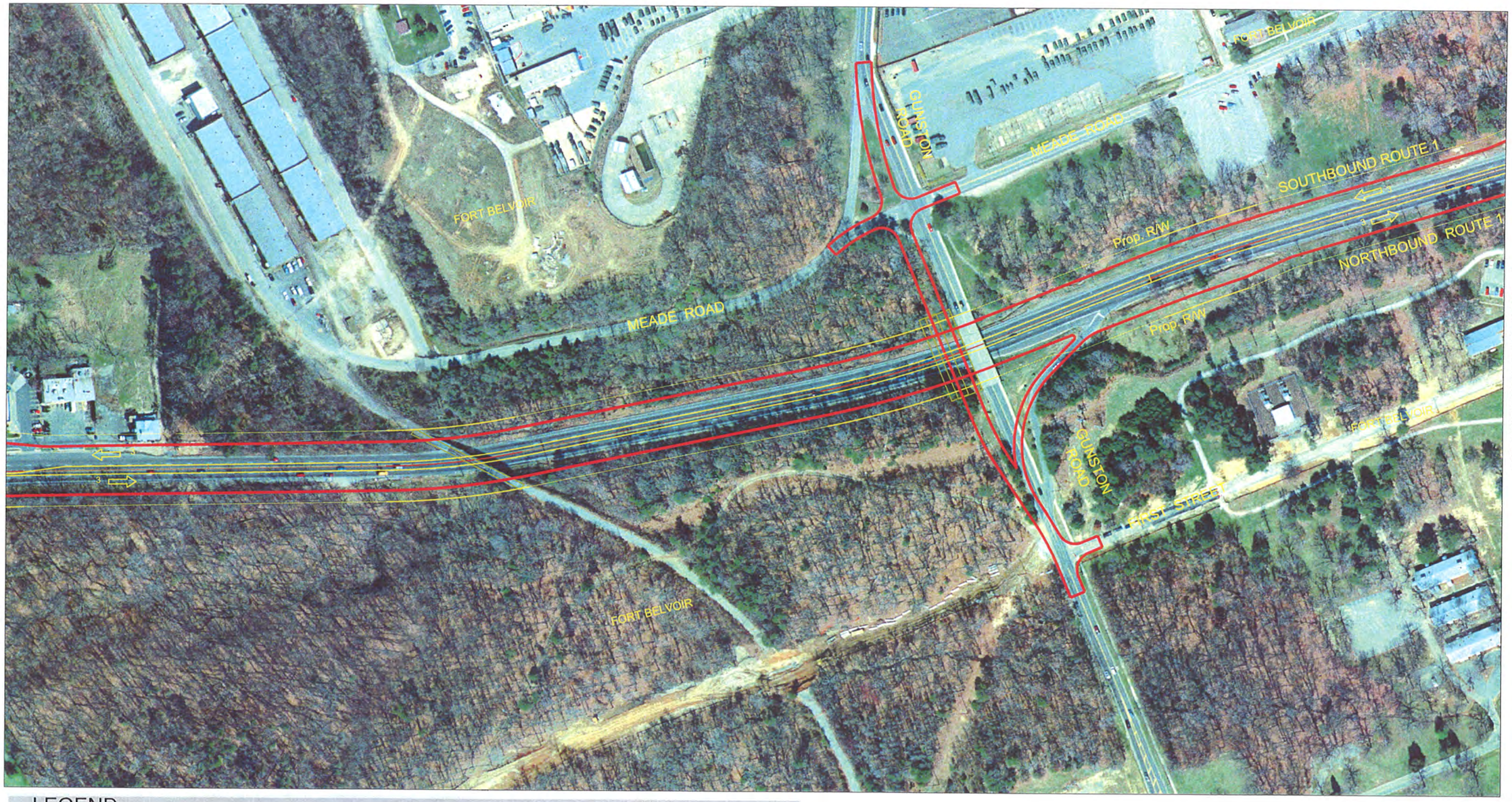
US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station



LEGEND

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- PROPOSED BRT STATION STOP
- PROPOSED WIDENING PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION
- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

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scale feet

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US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station

N

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FOR CONTINUATION SEE SHEET NO.

LEGEND

- LOCAL BUS STOP
- PROPOSED BRT STATION STOP
- PROPOSED WIDENING PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION
- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

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scale feet

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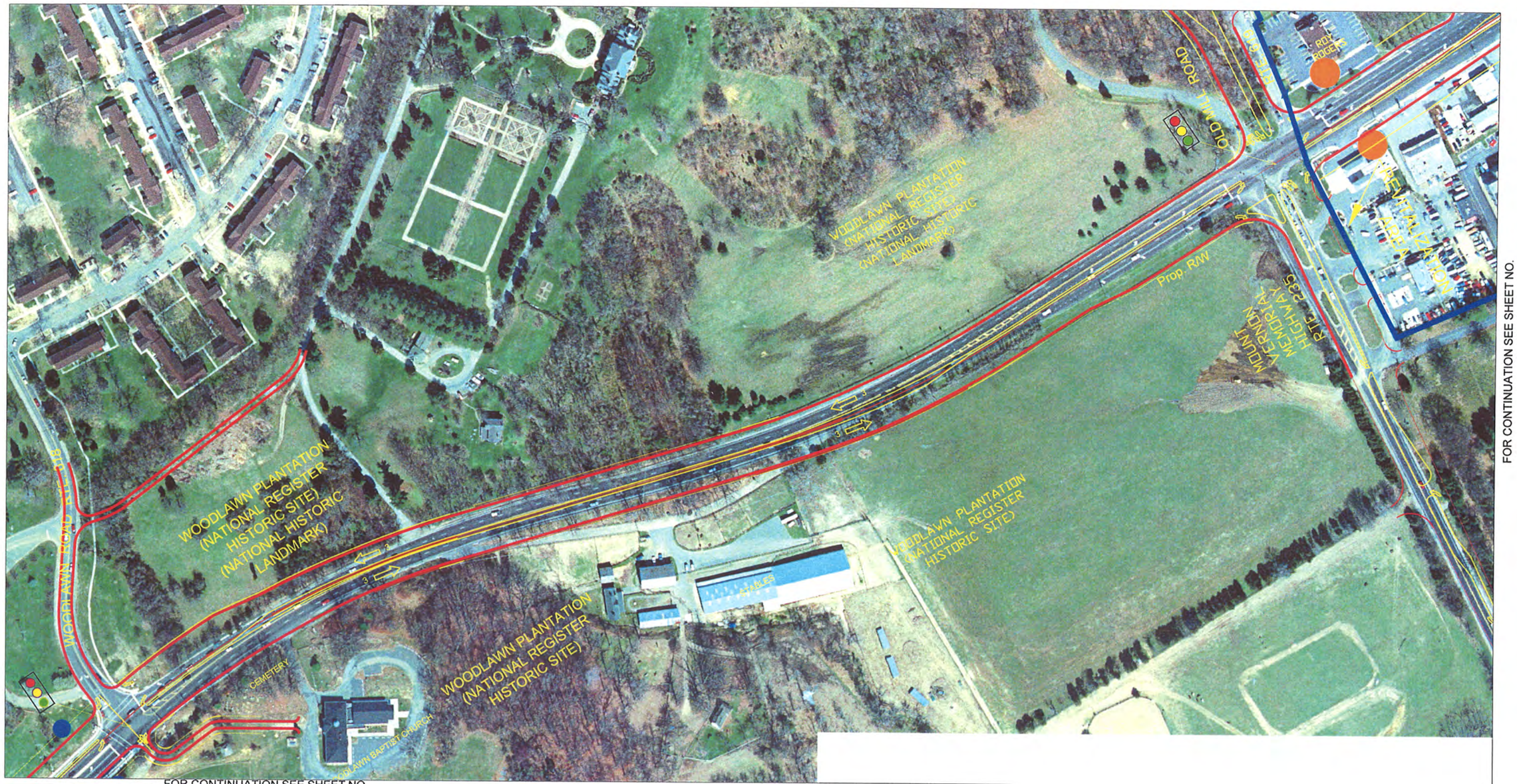
US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station



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LEGEND

- LOCAL BUS STOP
- PROPOSED BRT STATION STOP
- PROPOSED WIDENING PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION
- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

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US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station

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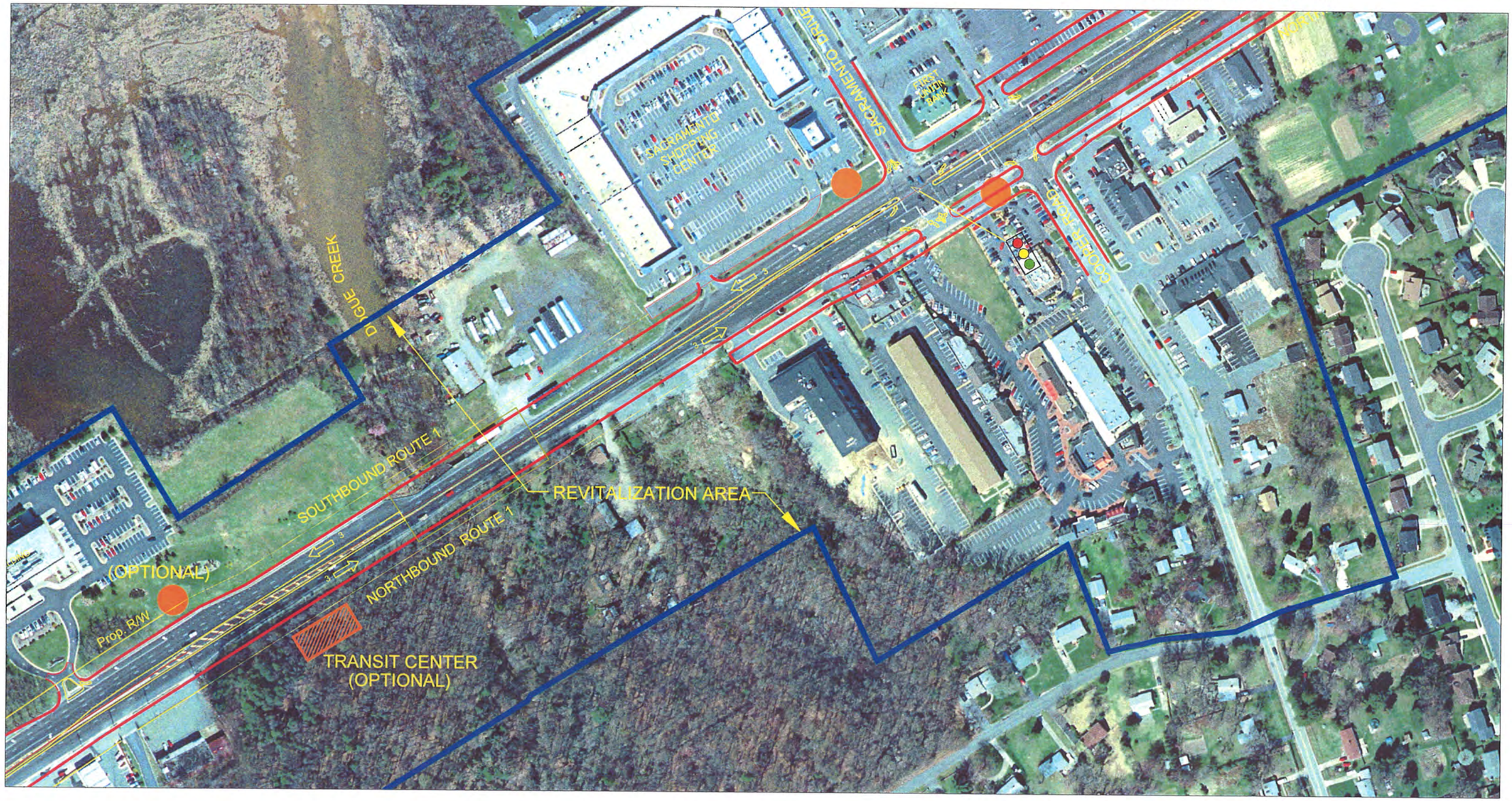

LEGEND

- LOCAL BUS STOP
- PROPOSED BRT STATION STOP
- PROPOSED TRANSIT CENTER
- PROPOSED WIDENING PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION
- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

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scale feet

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US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station

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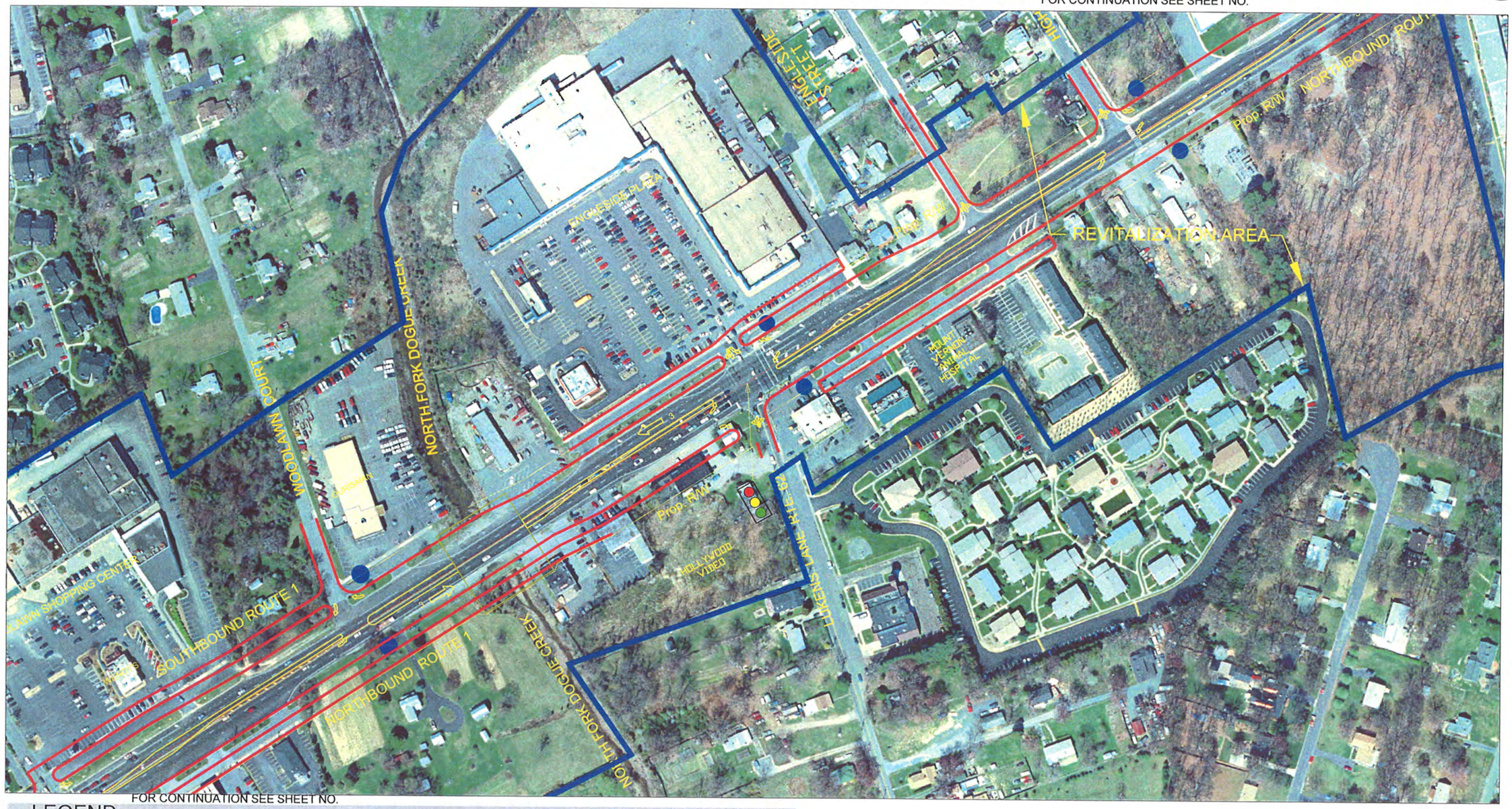

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LEGEND

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- PROPOSED WIDENING PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION
- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

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scale feet

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US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station

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LEGEND

- LOCAL BUS STOP
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scale feet

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US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station

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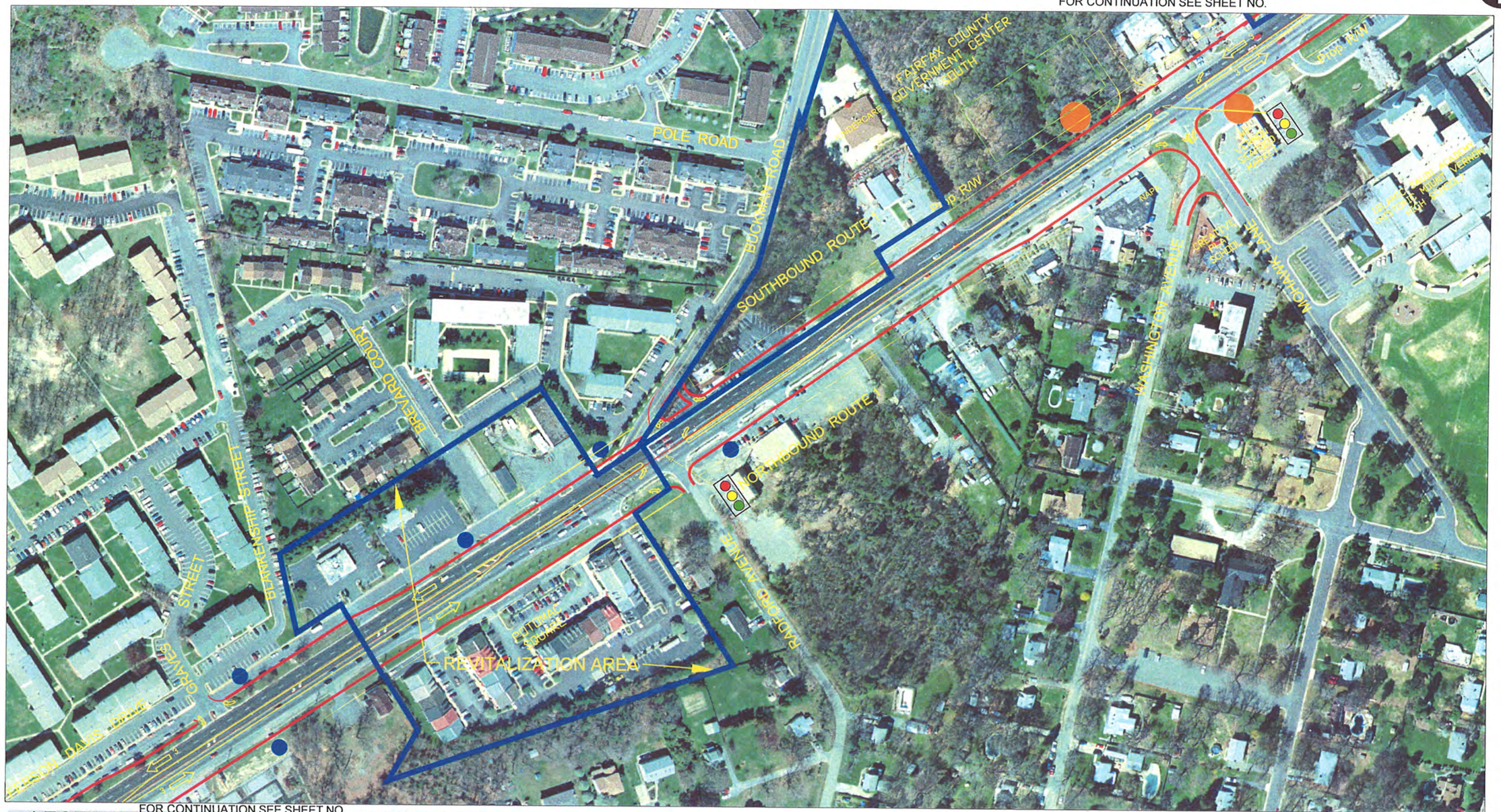

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LEGEND

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scale feet

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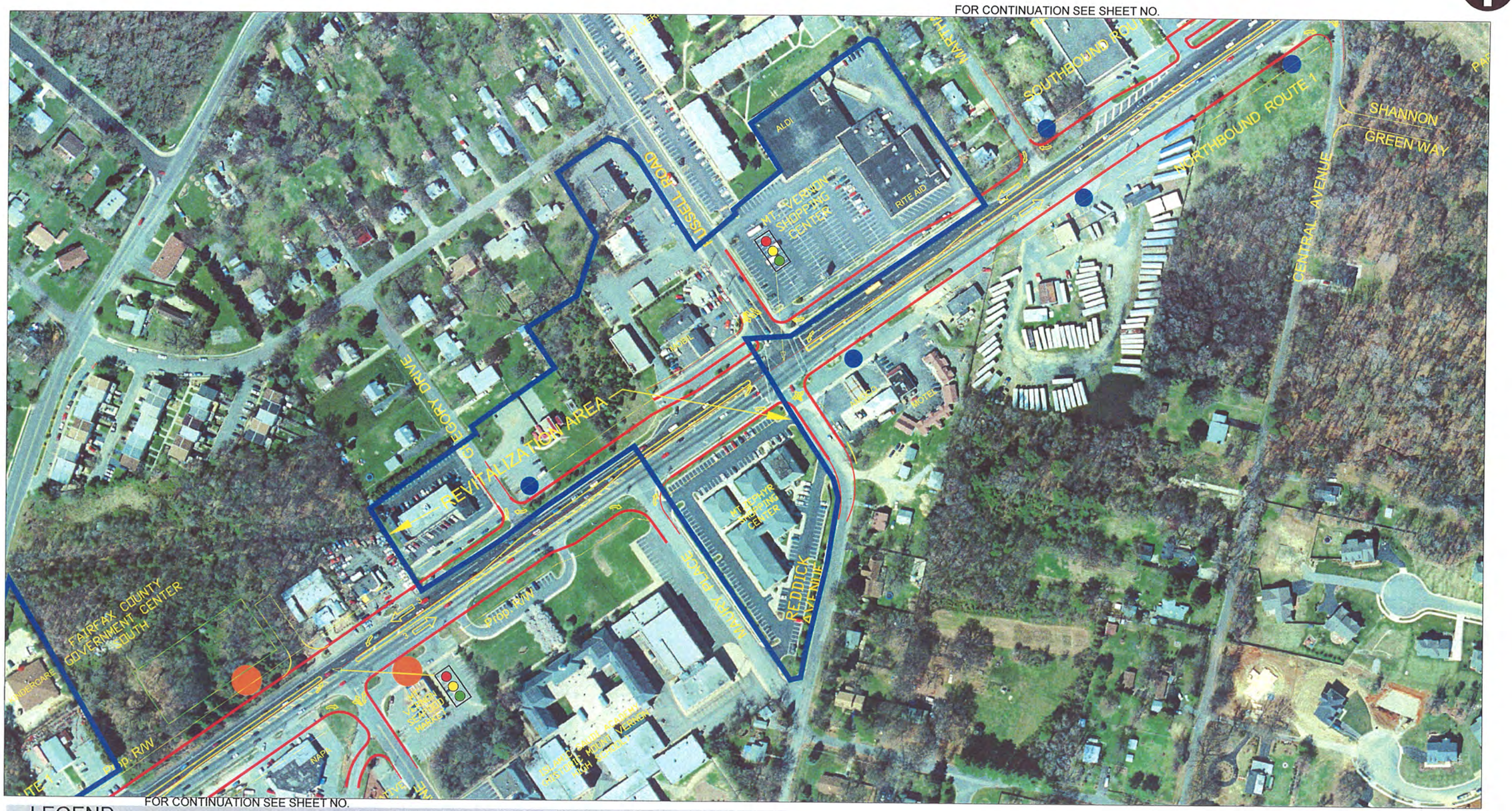
US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station



LEGEND

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scale feet

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US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station

LEGEND

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- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

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scale feet

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US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station

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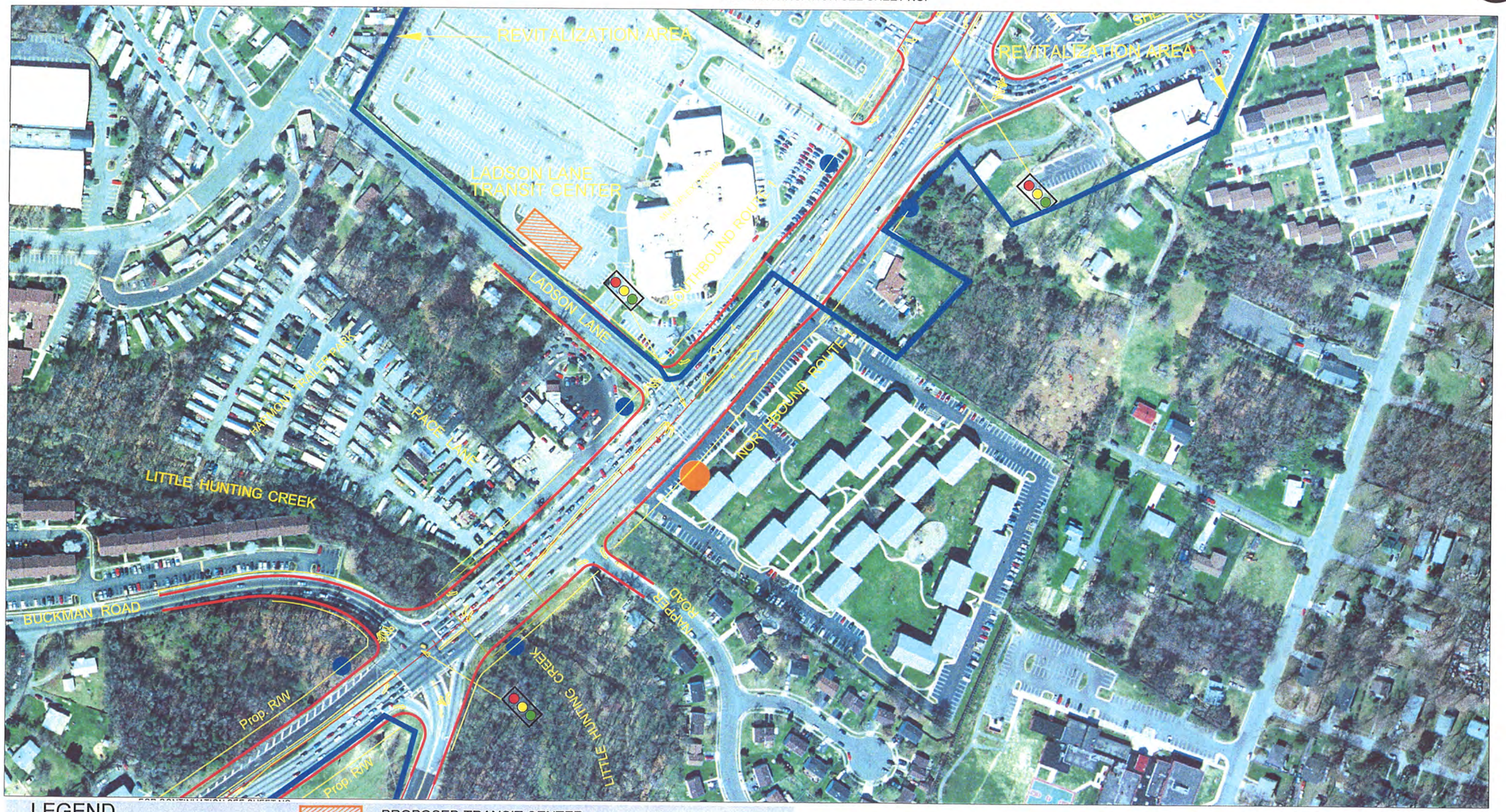

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LEGEND

- LOCAL BUS STOP
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scale feet

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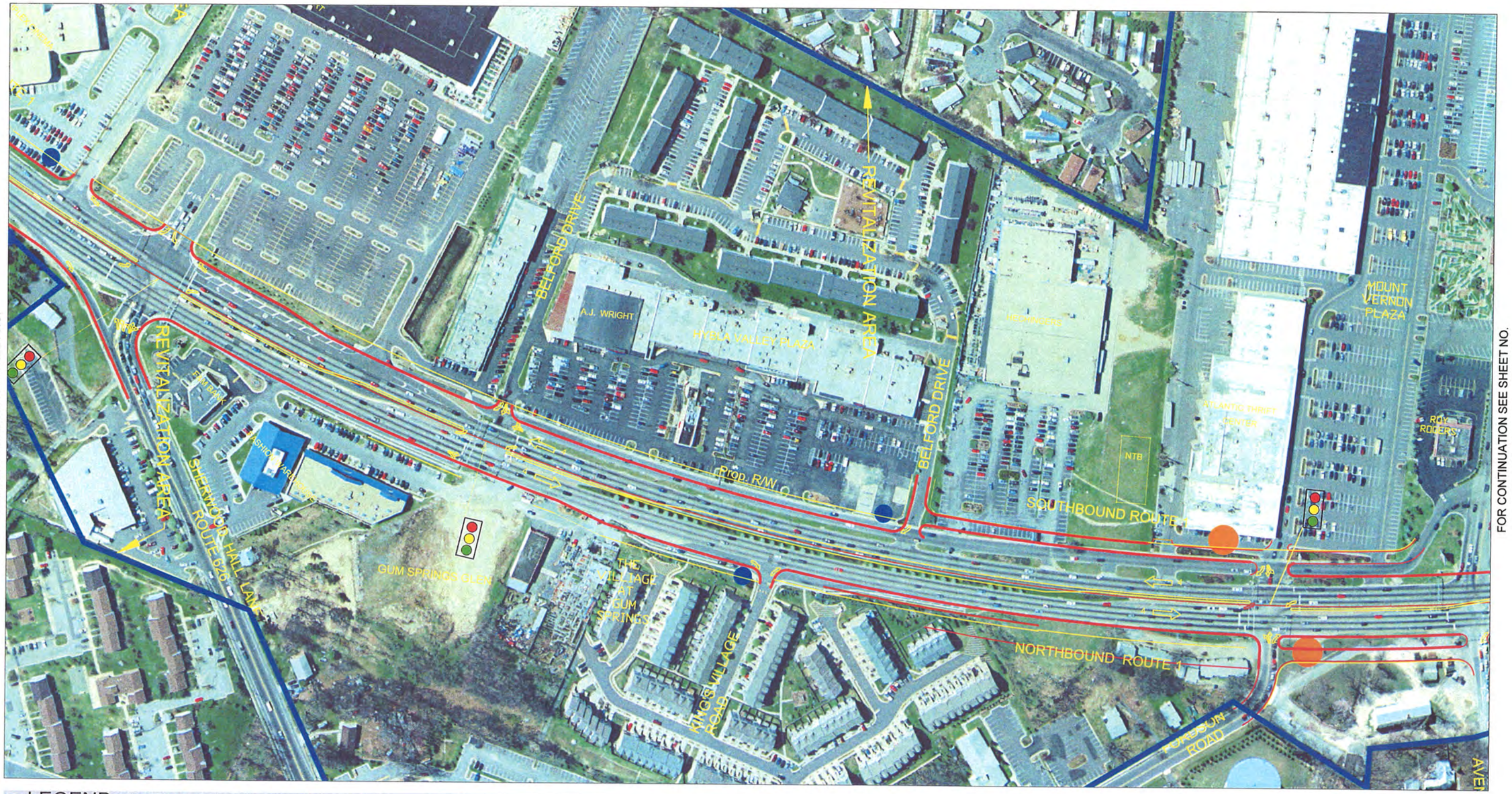
US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station



LEGEND

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- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

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scale feet

US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station

LEGEND

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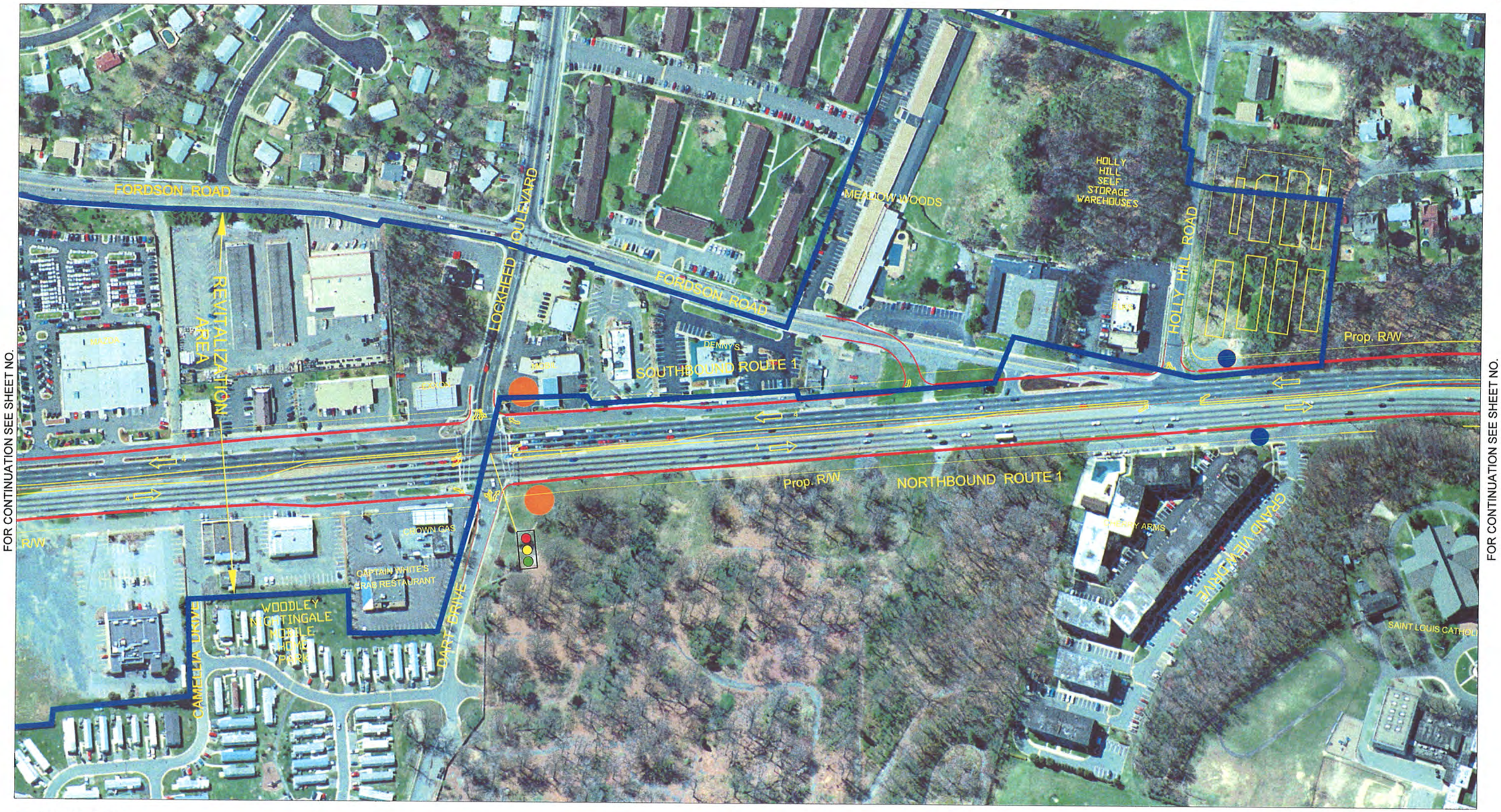
scale feet

US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station



FOR CONTINUATION SEE SHEET NO.

FOR CONTINUATION SEE SHEET NO.

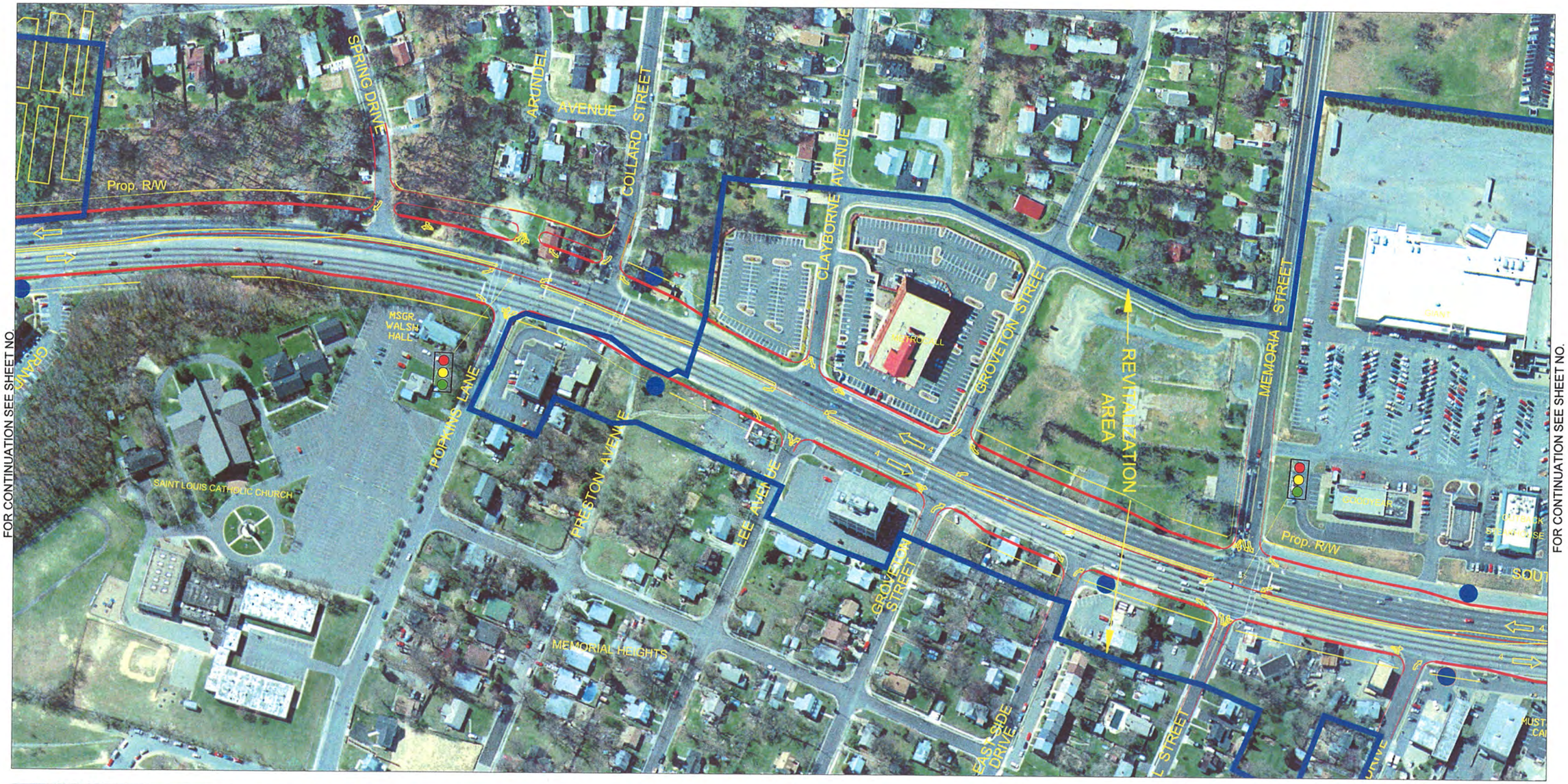
LEGEND

- LOCAL BUS STOP
- PROPOSED BRT STATION STOP
- PROPOSED WIDENING PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION
- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

200 0 100 200
scale feet

S:\TE...\GAIP\...G-ENG DEVELOP\PLAN\US ROUTE 1 - VIRGINIA\CAD\ROUTE1_REVISED-PLAN.dwg (Sheet 18)

US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station



LEGEND

- LOCAL BUS STOP
- PROPOSED BRT STATION STOP
- PROPOSED WIDENING PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION
- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

200 0 100 200
scale feet

US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station

LEGEND

- LOCAL BUS STOP
- PROPOSED BRT STATION STOP
- PROPOSED TRANSIT CENTER
- PROPOSED WIDENING PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION
- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

200 0 100 200
scale feet

US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station

FOR CONTINUATION SEE SHEET NO.

FOR CONTINUATION SEE SHEET NO.

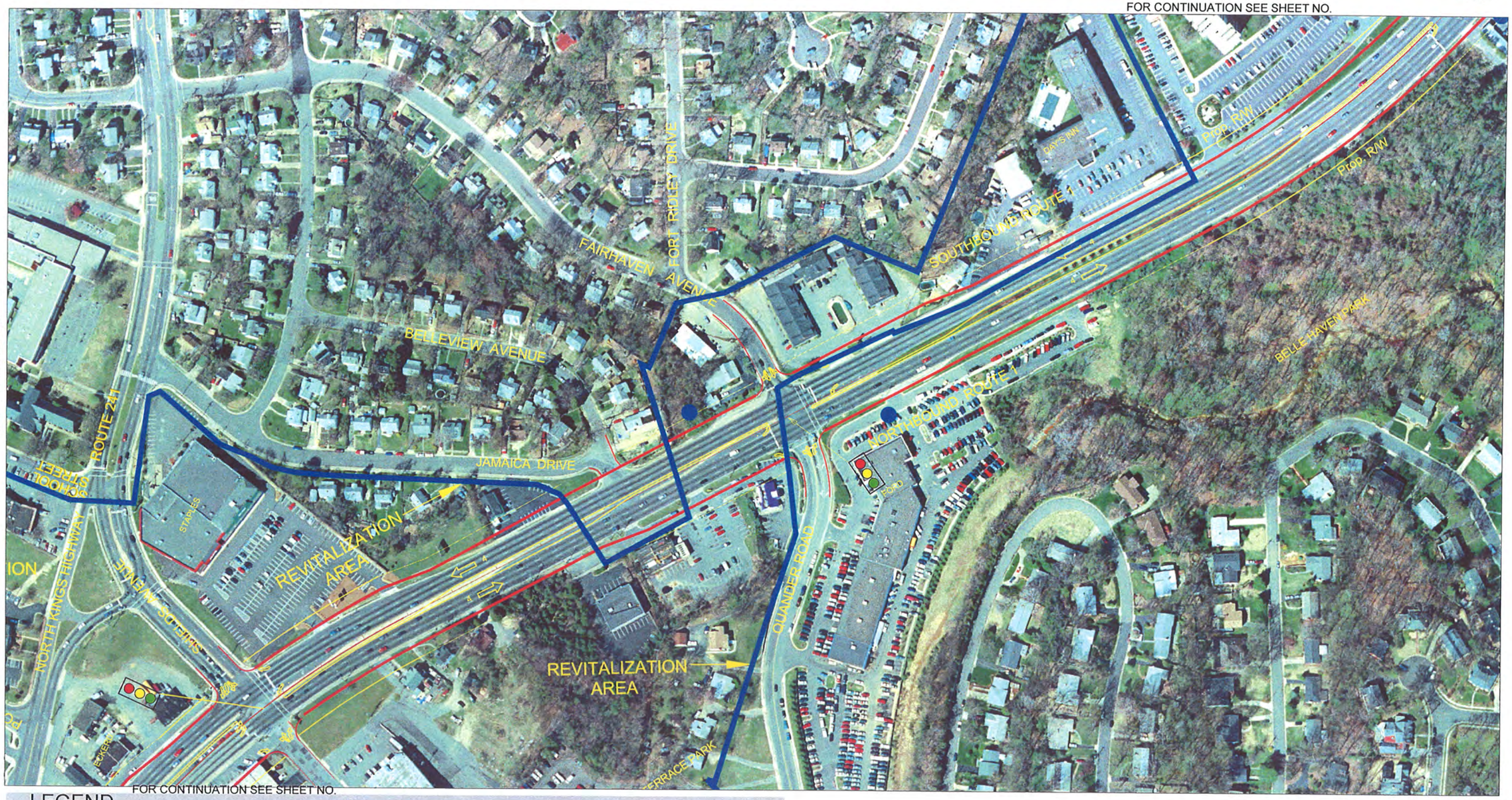
FOR CONTINUATION SEE SHEET NO.

LEGEND

- LOCAL BUS STOP
- PROPOSED BRT STATION STOP
- PROPOSED TRANSIT CENTER
- PROPOSED WIDENING PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION
- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

200 0 100 200
scale feet

US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station



LEGEND

- LOCAL BUS STOP
- PROPOSED BRT STATION STOP
- PROPOSED WIDENING PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT STUDY
- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

200 0 100 200
scale feet

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US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station

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FOR CONTINUATION SEE SHEET NO.

FOR CONTINUATION SEE SHEET NO.

LEGEND

- LOCAL BUS STOP
- PROPOSED BRT STATION STOP
- PROPOSED WIDENING PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION
- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

200 0 100 200
scale feet

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US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station

FOR CONTINUATION SEE SHEET NO.

FOR CONTINUATION SEE SHEET NO.

LEGEND

- LOCAL BUS STOP
- PROPOSED BRT STATION STOP
- PROPOSED WIDENING PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION
- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

200 0 100 200
scale feet

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US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station

LEGEND

- LOCAL BUS STOP
- PROPOSED BRT STATION STOP
- PROPOSED WIDENING PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION
- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

200 0 100 200
scale feet

S:\TEAMS\ENGA\PLANNING-ENG DEVELOP\PLDV-34 US ROUTE 1 - VIRGINIA\CADD\ROUTE1_REVISEDPLAN.dwg (Huntington Ave)

US Route 1 Transitway: Fort Belvoir to Huntington Metrorail Station

FOR CONTINUATION SEE SHEET NO.

FOR CONTINUATION SEE SHEET NO.

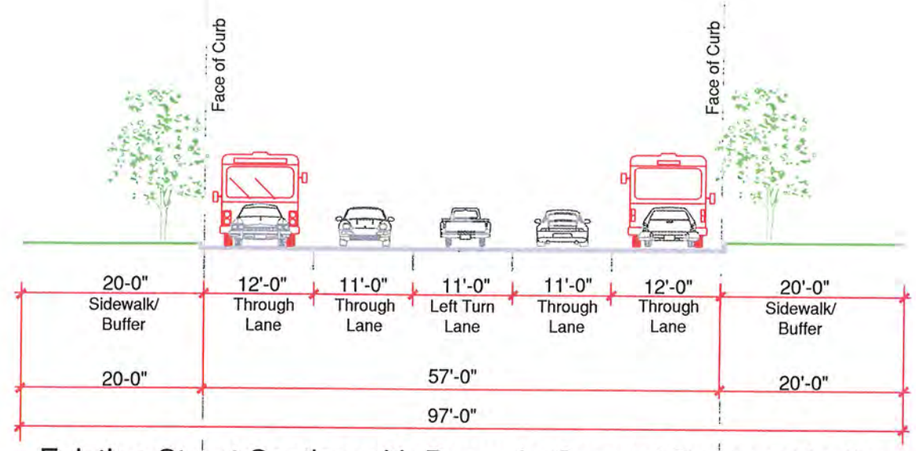
LEGEND

- LOCAL BUS STOP
- PROPOSED BRT STATION STOP
- PROPOSED WIDENING PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION
- PROPOSED R/W PER VDOT RTE. 1 LOCATION STUDY ALIGNMENT OPTION

200 0 100 200
scale feet

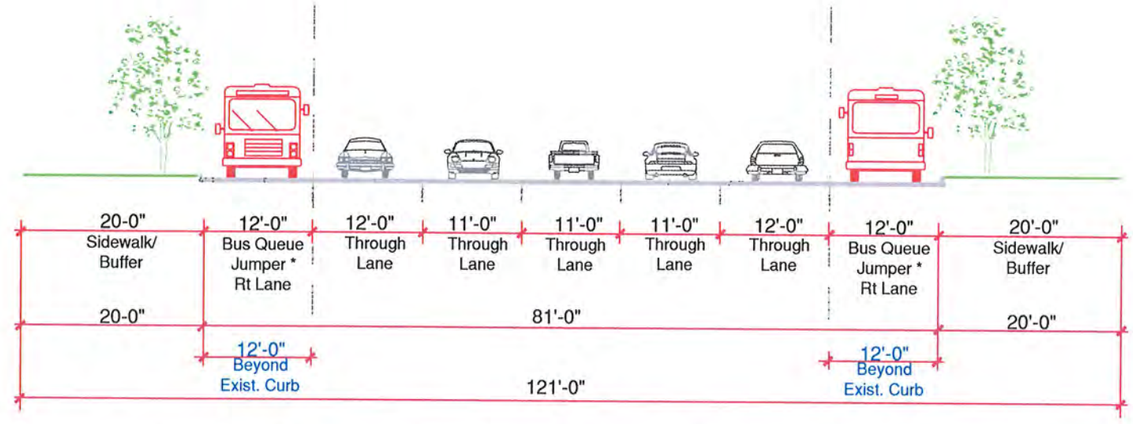
US Route 1 - Fort Belvoir to Huntington Metrorail Station

Segment 1 - US Route 1 Between Fairfax County Parkway and Mount Vernon Highway/Old Mill Road
Potential Transitway Phase 1



Existing Street Section with Buses in General Purpose Traffic at Key Intersections

In this phase, the existing roadway width is maintained and buses operate in general purpose lanes along Route 1. The right-of-way is approxmately 97' between Fairfax County Parkway and Mount Vernon Highway/Old Mill Road. Travel times and reliability for transit could be improved by implementing queue jumpers at intersections that show significant delays caused by traffic signal. This would require an additional width of 12' per queue lane for a minimum of length of 150'. The specific length of queue jumper would be determined as part of the design phase.



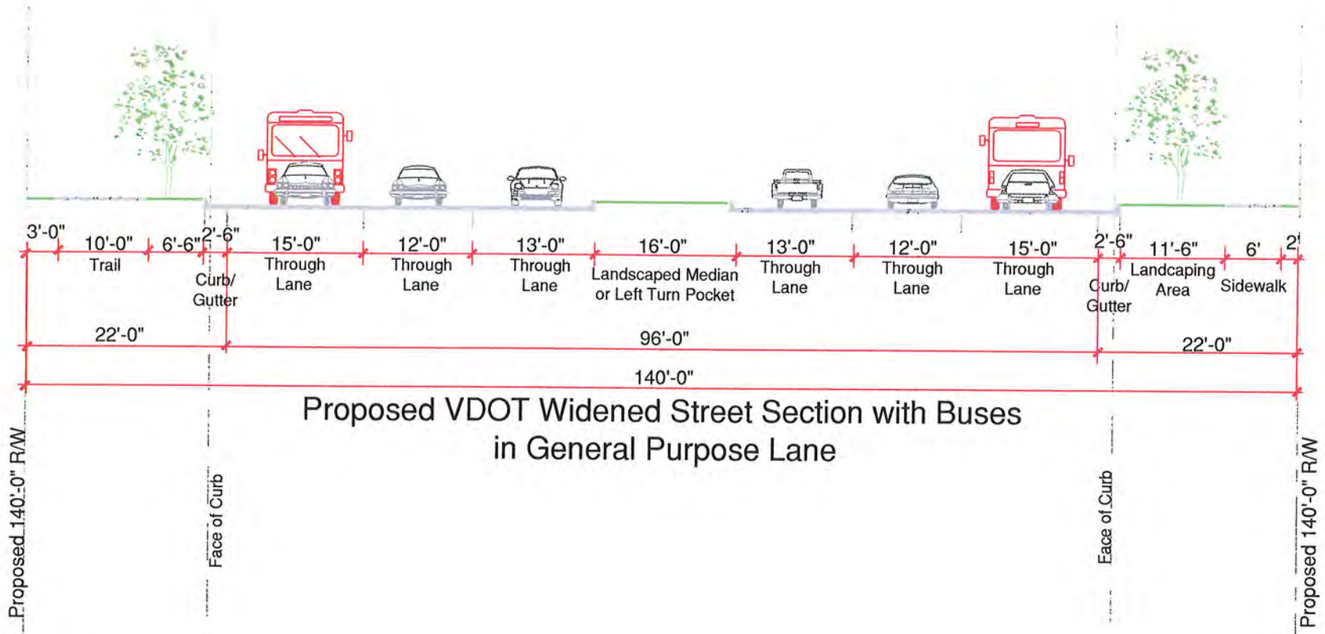
Proposed Street Section with Buses in Queue Jumper Lane at Key Intersections

US Route 1: Fort Belvoir to Huntington Metrorail Station

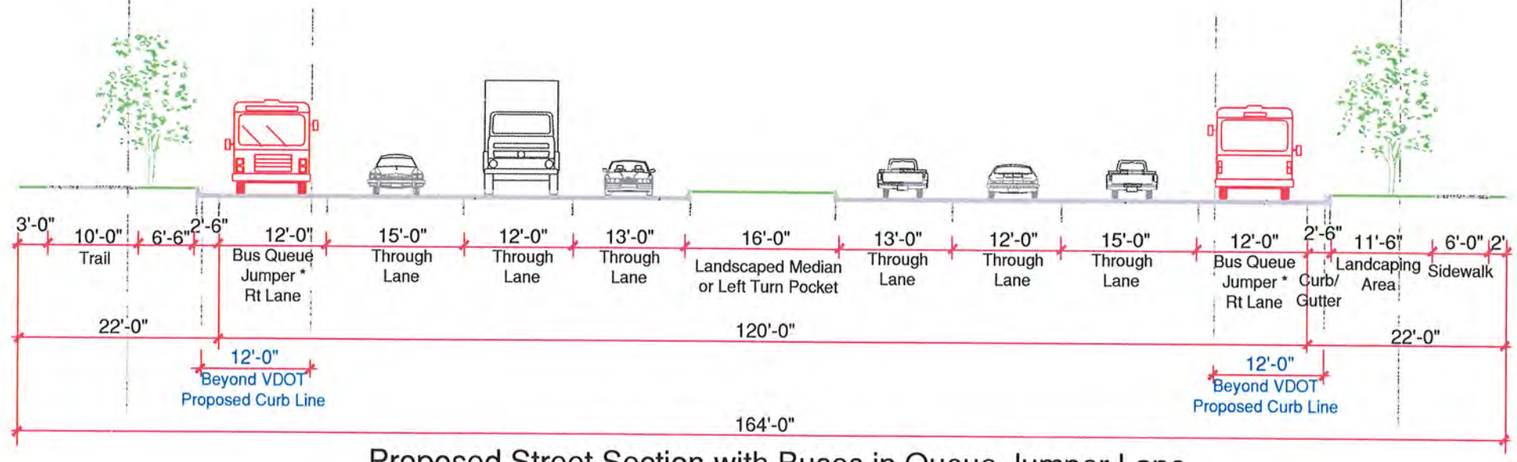
Segment 1 - US Route 1 Between Fairfax County Parkway and Mount Vernon Highway/Old Mill Road
Potential Transitway Phase 2

Phase 2 takes advantage of VDOT's plans to add a third lane in each direction between Fairfax County Parkway and Mount Vernon Highway (235 North)/Buckman Road. Buses would operate in this third lane with general purpose traffic. According to the VDOT plans, the right-of-way between the Fairfax County Parkway and Mount Vernon Highway/Old Mill Road would be 140' after widening. Travel times and service reliability could be improved by incorporating a queue jumper lane at intersections that show significant delays caused by traffic signals. A queue jumper lane would require an additional width of 12' per queue lane for a minimum length of 150'. The specific length of the queue jumper would be determined as part of the design phase.

Note: VDOT's plans show priority bus lanes starting north of Mount Vernon Highway/Buckman Road, therefore, there is no Priority Lane BRT Option for this segment of Route 1.



Proposed VDOT Widened Street Section with Buses in General Purpose Lane



Proposed Street Section with Buses in Queue Jumper Lane at Key Intersections

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US Route 1 - Fort Belvoir to Huntington Metrorail Station

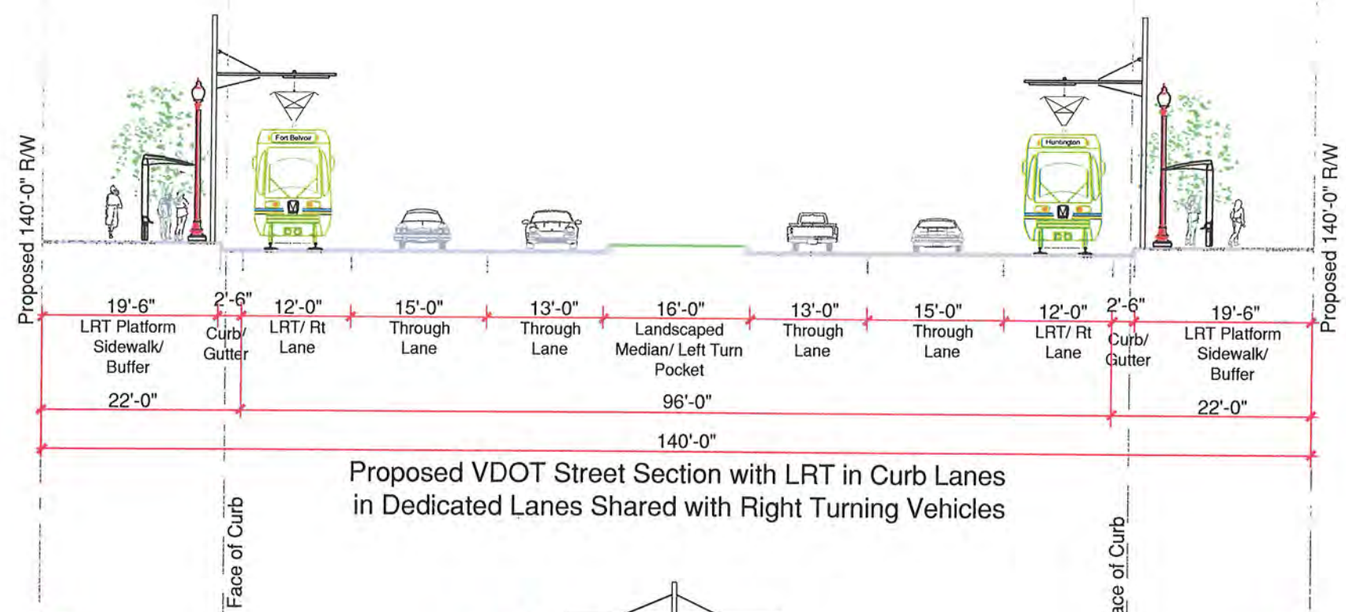
Segment 1 - US Route 1 Between Fairfax County Parkway and Mount Vernon Highway/Old Mill Road
Potential Transitway Phase 3

Phase 3 considers future Light Rail Transit operating in semi-exclusive right-of-way within the Route 1 corridor. As shown in this graphic, LRT could operate in either the curb lanes or in the median.

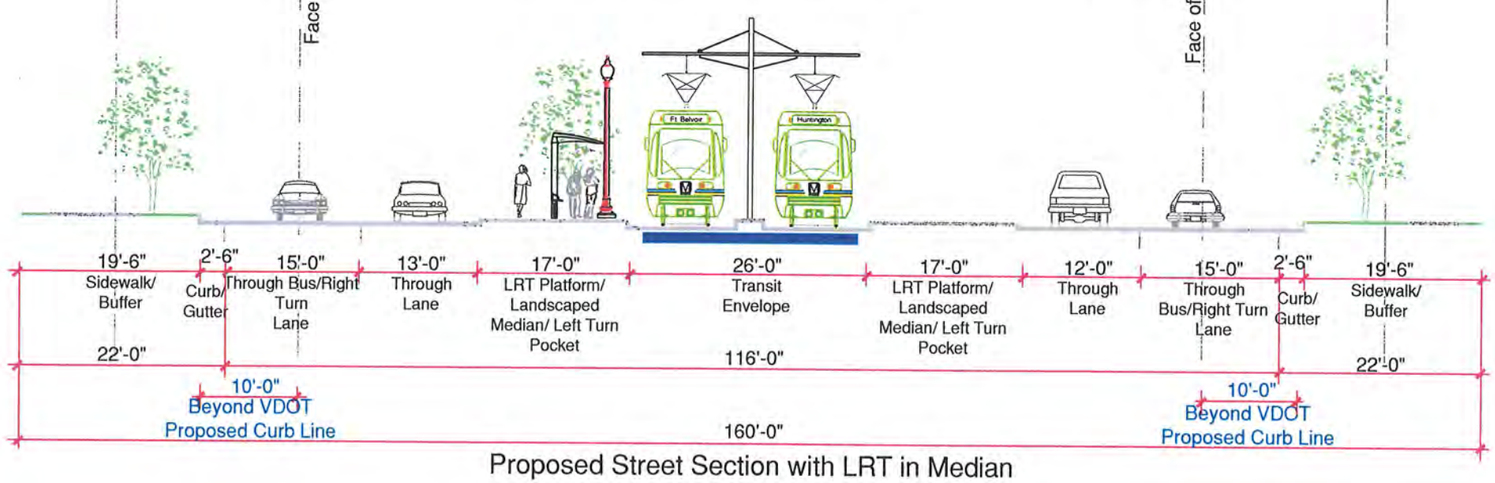
Under the curb lane option, LRT could operate within the VDOT proposed right-of-way of 140' for this segment and utilize the sidewalk for the LRT platform stops. LRT would operate in the third lane added under the VDOT widening plans and would share the lane with right turning vehicles. Implementing three travel lanes and one transit lane in each direction would require an additional 24', increasing the right-of-way width to 164'.

Under the median option, LRT would operate in an exclusive 26' transit envelope flanked by medians that would alternately serve as LRT platform stops, landscaped medians or left turn pockets at signalized intersections. The overall right-of-way width required would be 160', an additional 20' over the VDOT future proposed right-of-way of 140'.

This sheet has been prepared to illustrate the basic concept of LRT operating within the Route 1 corridor. Additional planning studies and detailed engineering development would be required to decide whether LRT is appropriate for this corridor and its location within Route 1 roadway (i.e., curb side or median).



Proposed VDOT Street Section with LRT in Curb Lanes in Dedicated Lanes Shared with Right Turning Vehicles



Proposed Street Section with LRT in Median in Dedicated Right-of-Way

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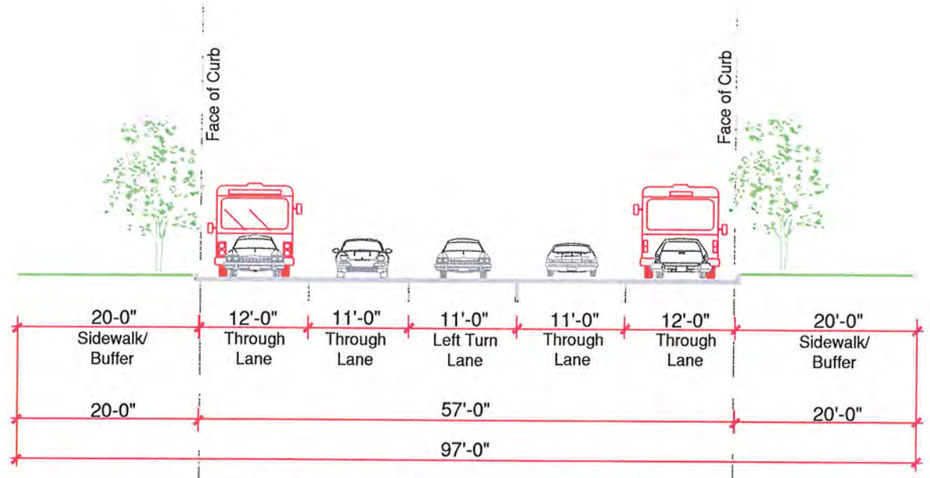
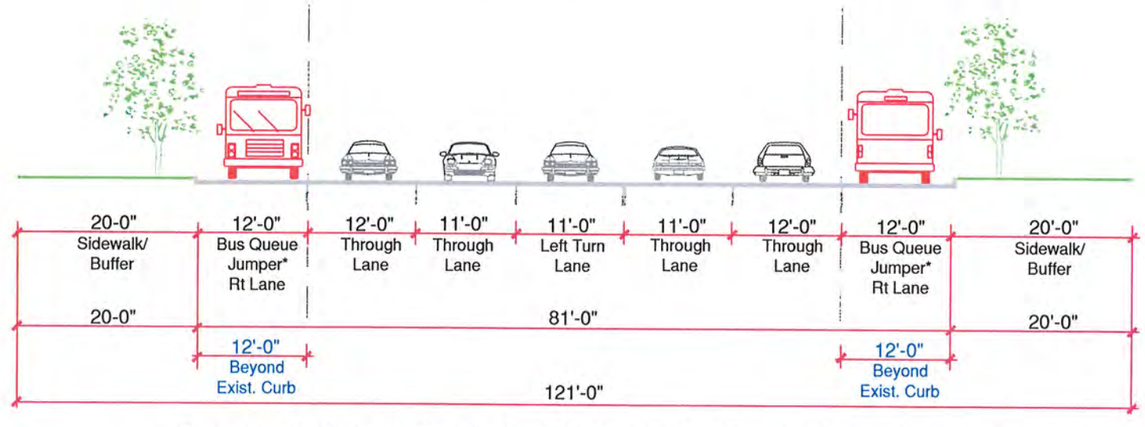
US Route 1 - Fort Belvoir to Huntington Metrorail Station

Segment 2 - US Route 1 Between Old Mill Road and Mount Vernon Highway (235 North)/Buckman Road
Potential Transitway Phase 1

For this segment of Route 1, the right-of-way is approximately 97' between Old Mill Road and Mount Vernon Highway (235 North)/Buckman Road. Adding queue jumper lanes at key intersections to improve travel times would require an additional width of 12' per queue lane for a minimum length of 150'. The specific length of the queue jumper would be determined as part of the design phase.



Existing Street Section with Buses in General Purpose Traffic at Key Intersections



Proposed Street Section with Buses in Queue Jumper Lane at Key Intersections

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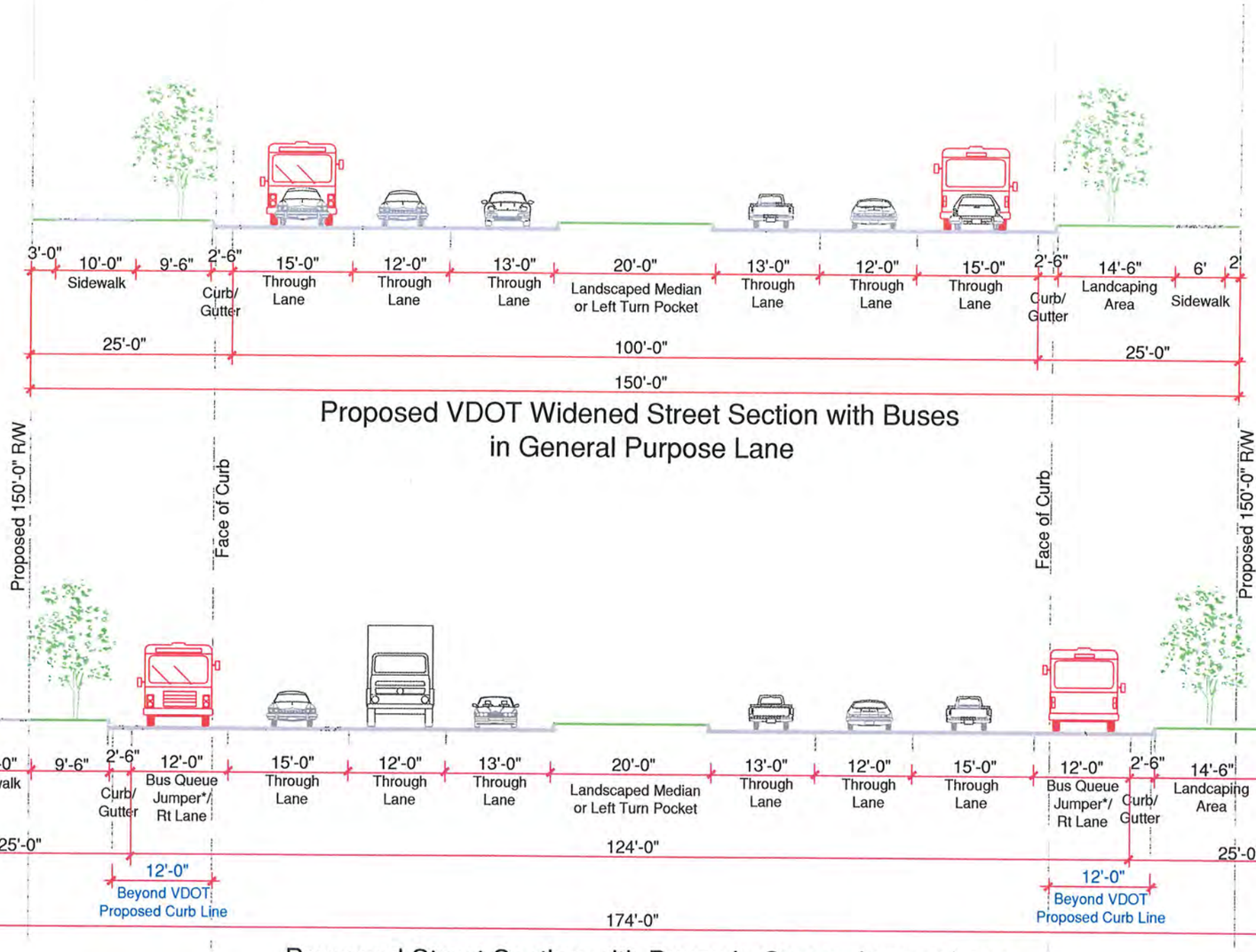
US Route 1 - Fort Belvoir to Huntington Metrorail Station

Segment 2 - US Route 1 Between Old Mill Road and Mt. Vernon Highway (235 North)/Buckman Road
Potential Transitway Phase 2

As in the first segment, Phase 2 takes advantage of VDOT's plans to add a third lane in each direction between Old Mill Road and Mount Vernon Highway (235 North)/Buckman Road. Buses would operate in this third lane with general purpose traffic. According to the VDOT plans, the right-of-way between Old Mill Road and Mount Vernon Highway (235 North)/Buckman Road would be 150' after widening. Again adding queue jumper lanes at key intersections would require an additional width of 12' per queue lane for a minimum length of 150'. The specific length of the queue jumper would be determined as part of the design phase.

Note: VDOT's plans show priority bus lanes starting north of Mount Vernon Highway/Buckman Road, therefore, there is no Priority Lane BRT option for this segment of Route 1.



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US Route 1 - Fort Belvoir to Huntington Metrorail Station

Segment 2 - US Route 1 Between Old Mill Road and Mt. Vernon Highway (235 North)/Buckman Road

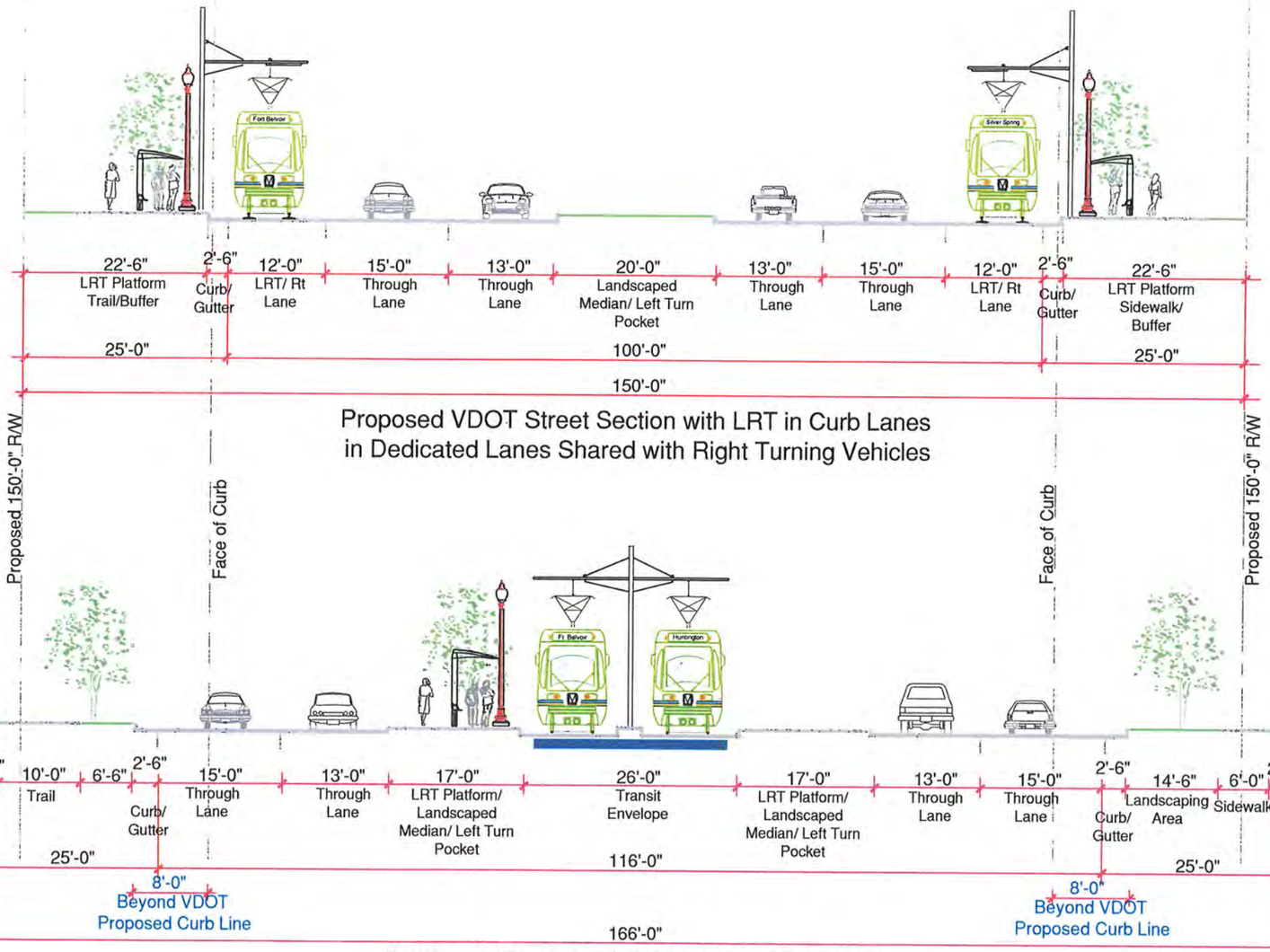
Potential Transitway Phase 3

This graphic depicts LRT operating in either the curb lanes or in the median in this "middle" segment of the Route 1 study area.

Under the curb lane option, LRT could operate within the VDOT proposed right-of-way of 150' for this segment and utilize the sidewalk for the LRT platform stops. LRT would operate in the third lane added under the VDOT widening plans and would share the lane with right turning vehicles. Implementing three travel lanes and one transit lane in each direction would require an additional 24', increasing the right-of-way width to 174'.

Under the median option, LRT would operate in an exclusive 26' transit envelope flanked by medians that would alternately serve as LRT platform stops, landscaped medians or left turn pockets at signalized intersections. The overall right-of-way width required would be 166', an additional 16' over the VDOT future proposed right-of-way of 150'.

This sheet has been prepared to illustrate the basic concept of LRT operating within the Route 1 corridor. Additional planning studies and detailed engineering development would be required to decide whether LRT is appropriate for this corridor and location within the Route 1 roadway (i.e., curb side or median).



Proposed Street Section with LRT in Dedicated Center Lane with Split Median

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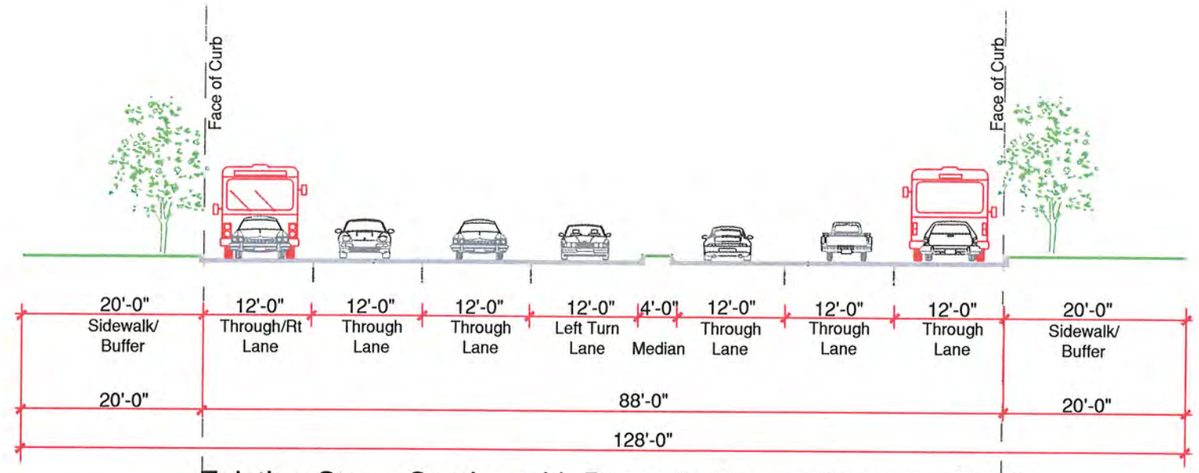
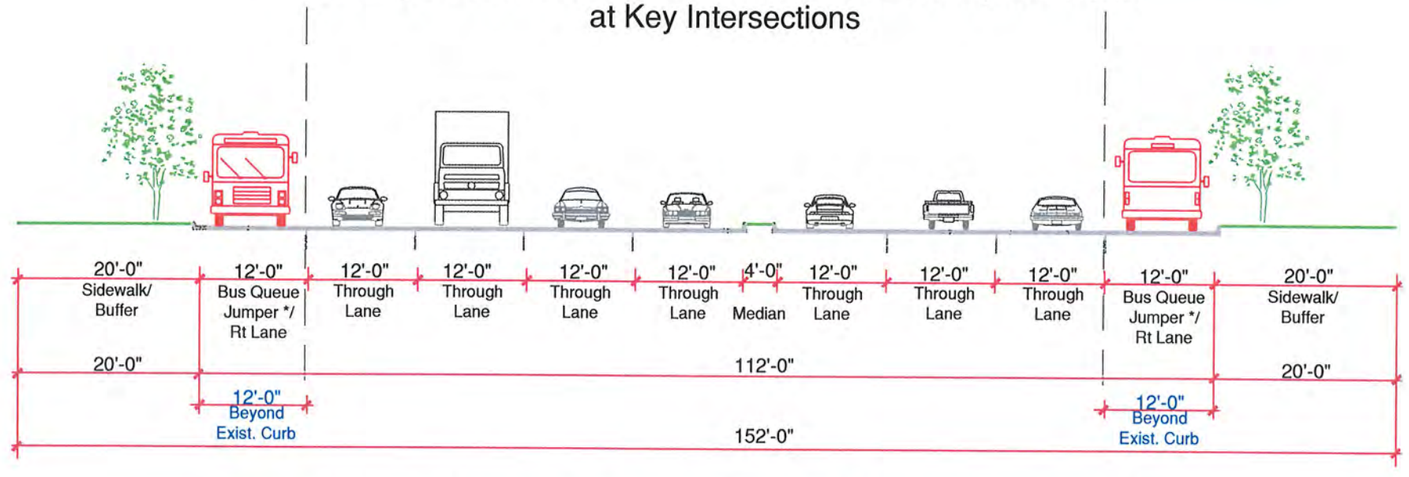
US Route 1 - Fort Belvoir to Huntington Metrorail Station

Segment 3 - US Route 1 Between Mount Vernon Highway/Buckman Road to Huntington Avenue
Potential Transitway Phase 1

In this last segment of the Route 1 study area the right-of-way is approxmately 128' between Mount Vernon Highway/Buckman Road. Adding queue jumper lanes at this intersection to improve travel times would require an additional width of 12' for a minimum length of 150'. The specific length of the queue jumper would be determined as part of the design phase.



Existing Street Section with Buses in General Purpose Traffic at Key Intersections



Proposed Street Section with Buses in Queue Jumper Lane at Key Intersections

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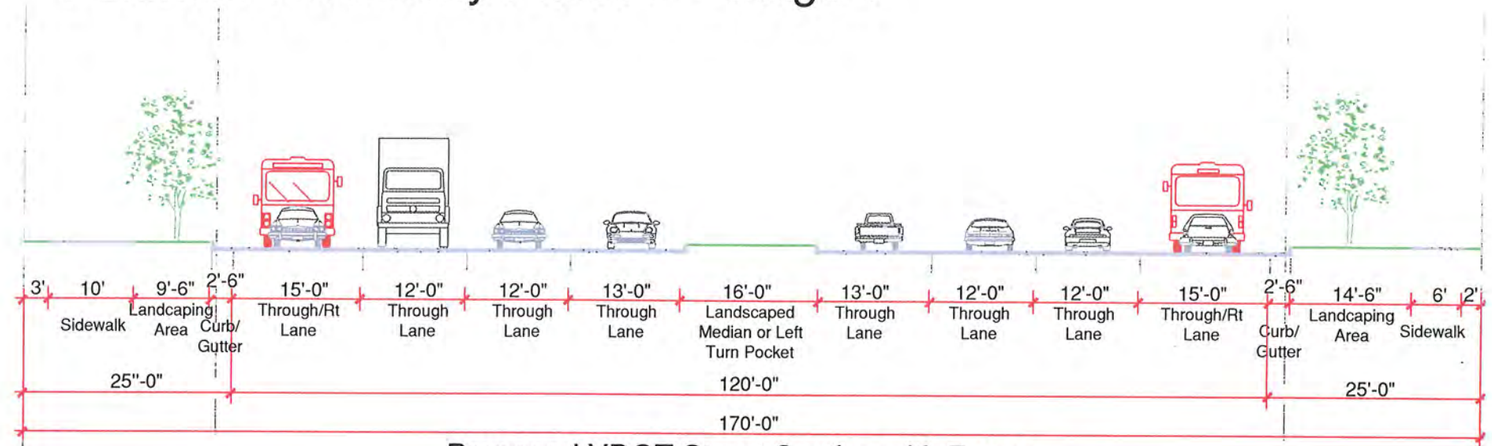
US Route 1: Fort Belvoir to Huntington Metrorail Station

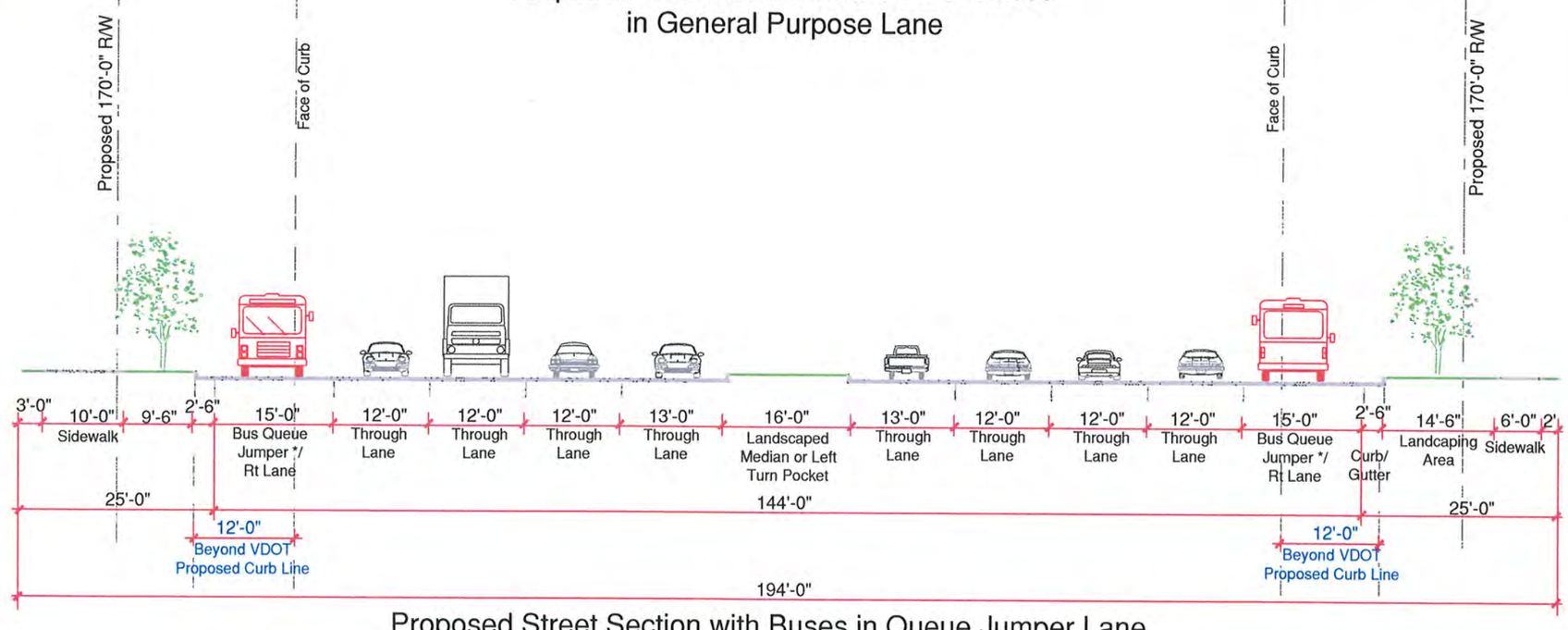
Segment 3 - US Route 1 Between Mount Vernon Highway/Buckman Road to Huntington Avenue

Potential Transitway Phase 2 - Stage 1

Again Phase 2 takes advantage of VDOT's plans to add a third lane in each direction between Mount Vernon Highway /Buckman Road and Huntington Avenue. In Phase 2 Stage 1, buses would operate in this third lane along with general purpose traffic. According to the VDOT plans, the right-of-way between Mount Vernon Highway/Buckman Road and Huntington Avenue would be 170' after widening. Adding a queue jumper lane would require an additional width of 12' per queue lane for a minimum length of 150'. The specific length of the queue jumper would be determined as part of the design phase.



Proposed VDOT Street Section with Buses in General Purpose Lane



Proposed Street Section with Buses in Queue Jumper Lane at Key Intersections

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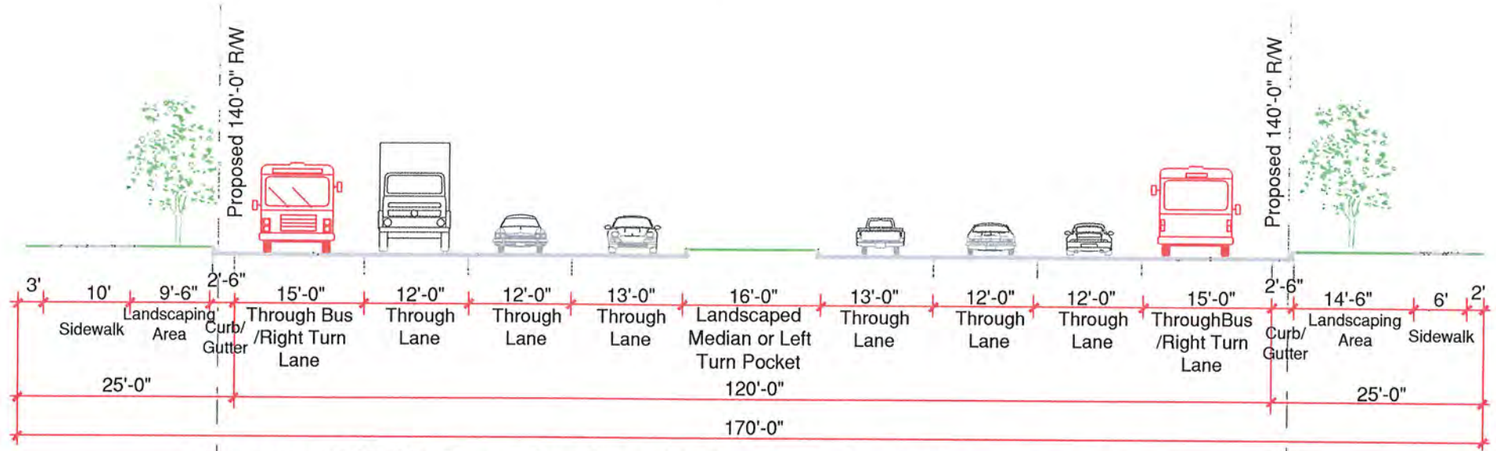
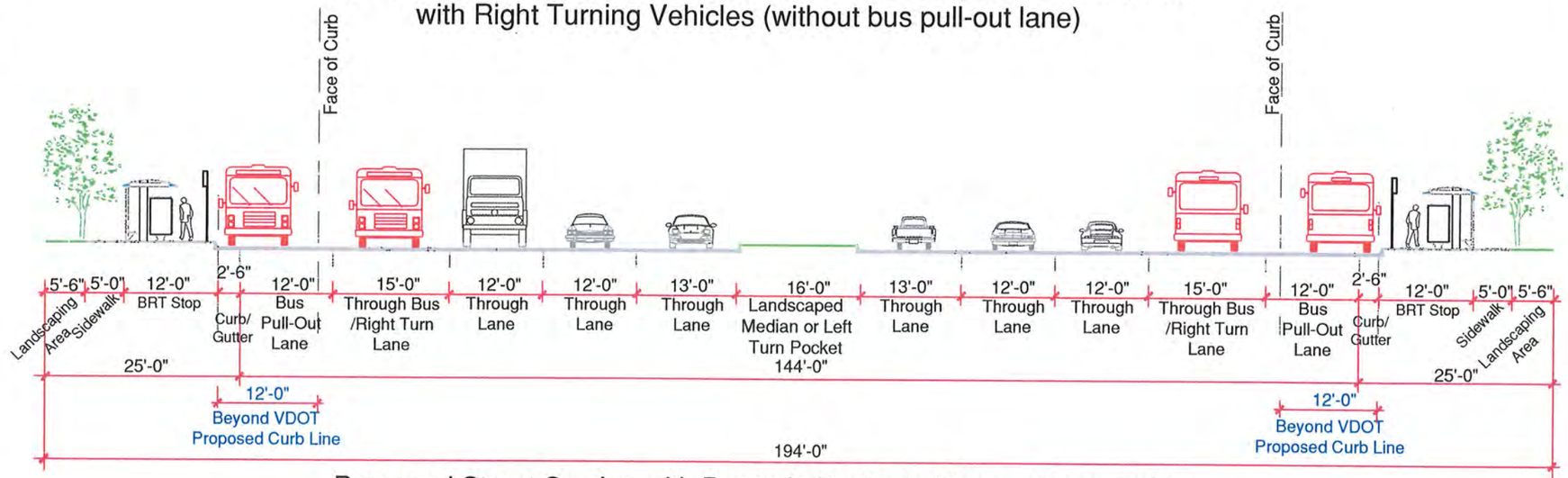
US Route 1 - Fort Belvoir to Huntington Metrorail Station

Segment 3 - US Route 1 Between Mount Vernon Highway/Buckman Road to Huntington Avenue
Potential Transitway Phase 2 - Stage 2

This second stage of Phase 2 takes advantage of VDOT's plans to add a fourth lane in each direction between Mount Vernon Highway /Buckman Road and Huntington Avenue. It is envisioned that this fourth lane would be dedicated for buses and vehicles making right turns. According to the VDOT plans, the right-of-way between Mount Vernon Highway/Buckman Road and Huntington Avenue would be 170' after widening. Travel times and service reliability for transit would be improved by providing these priority bus lanes and by providing bus pull-outs at bus stops to allow BRT service to pass buses serving the local bus stops. Bus pull-out lanes would require an additional width of 12' for a length of approximately 250' (sufficient to accommodate two bus bays plus entrance and exit tapers).



Proposed VDOT Street Section with Buses in Dedicated Lanes Shared with Right Turning Vehicles (without bus pull-out lane)



Proposed Street Section with Buses in Dedicated Lanes Shared with Right Turning Vehicles (with bus pull-out lane)

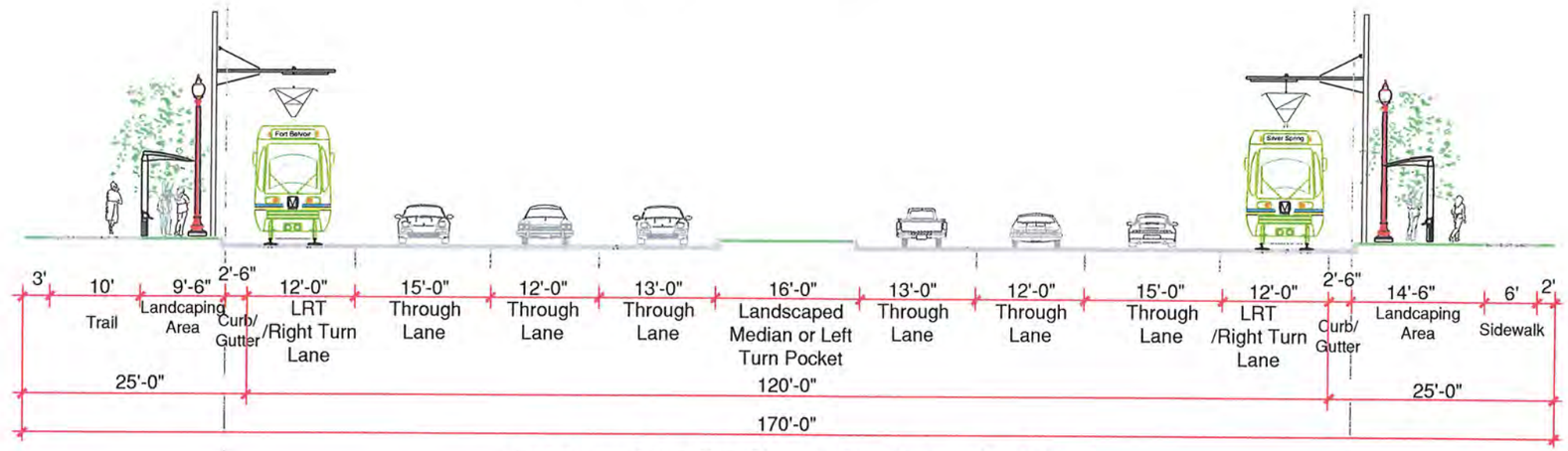
US Route 1 - Fort Belvoir to Huntington Metrorail Station

Segment 3 - US Route 1 Between Mount Vernon Highway/Buckman Road to Huntington Avenue
Potential Transitway Phase 3

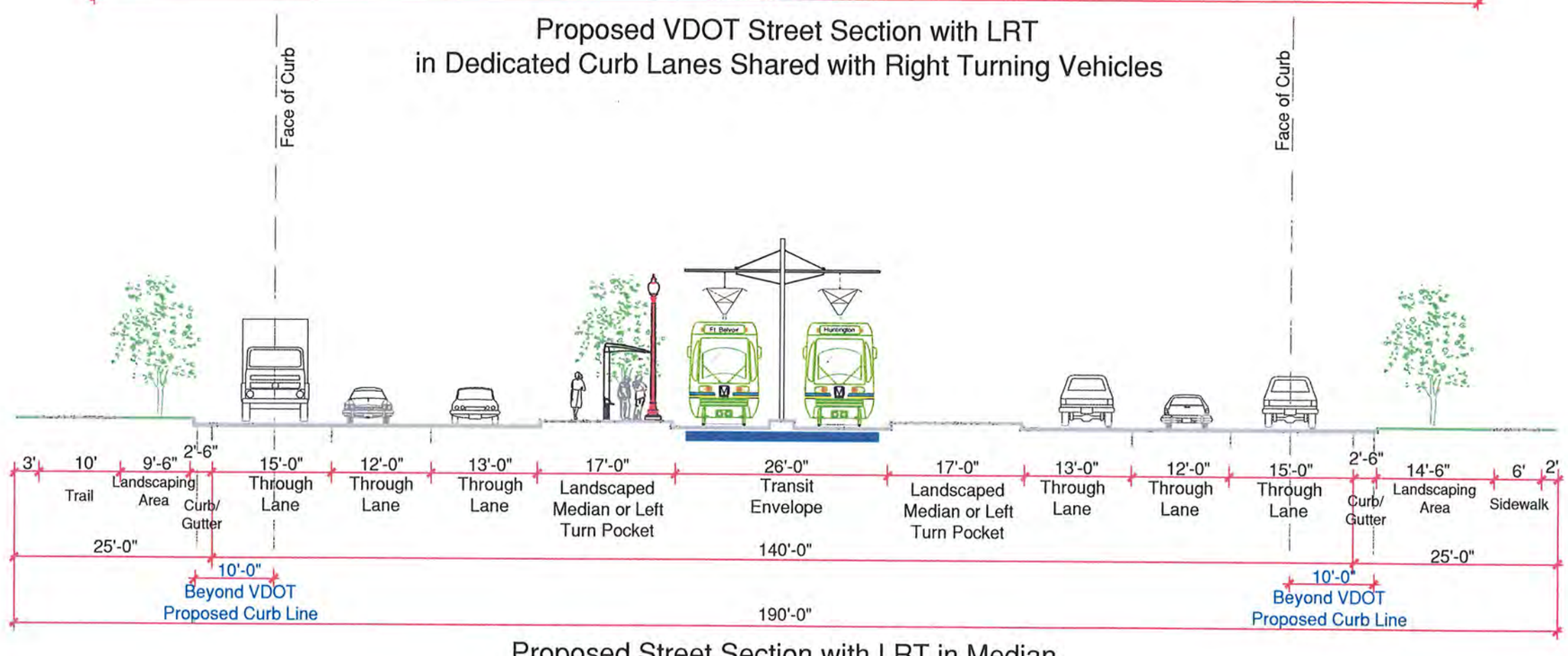
In Phase 3, under the curb lane option for this segment of the Route 1 study area, LRT could operate within the VDOT proposed right-of-way of 170' and utilize the sidewalk for LRT platform stops. LRT would operate in the fourth lane added under the VDOT widening plans and would share the lane with right turning vehicles. Implement four travel lanes and one transit lane in each direction would require an additional 24', increasing the right-of-way width to 194'.

Under the median option for this segment, LRT would operate in an exclusive 26' transit envelope flanked by medians that would alternately serve as LRT platform stops, landscaped medians or left turn pockets at signalized intersections. The overall right-of-way width required would be 190', an additional 20' over the VDOT future proposed right-of-way of 170'.

This sheet has been prepared to illustrate the basic concept of LRT operating within the Route 1 corridor. Additional planning studies and detailed engineering development would be required to decide whether LRT is appropriate for this corridor and its location within the Route 1 roadway (i.e., curb side or median).



Proposed VDOT Street Section with LRT
in Dedicated Curb Lanes Shared with Right Turning Vehicles



Proposed Street Section with LRT in Median
in Dedicated Right-of-Way

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